Trans Adriatic Pipeline



Integrated ESIA Greece
Section 6 - Environmental, Socioeconomic and Cultural Heritage Baseline

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6 ENVIRONMENTAL ENVIRONMENTAL, SOCIOECONOMIC AND CULTURAL HERITAGE BASELINE

6.1 Introduction

This section provides a summary of information currently available on the existing natural, socioeconomic and cultural environment which may potentially be affected by the TAP Project in Greece.

The description of the baseline has the following main objectives:

- identify the key environmental, socioeconomic conditions and cultural heritage in areas potentially affected by the Project and highlight those that may be vulnerable to aspects of the Project;
- describe and where possible quantify their characteristics (nature, condition, quality, extent, etc) now and in the future, in the absence of the Project;
- provide data collected through desktop research and field surveys to aid the prediction and evaluation of possible impacts undertaken in *Section 8* of this ESIA; and
- inform judgements about the importance, value and sensitivity/vulnerability of resources and receptors.

The environmental, socioeconomic and cultural heritage baseline description is structured as follows:

- Physical Environment - including geology and soils, land, hydrology, surface and ground water resources, air, noise etc.
- Biological Environment – including aquatic and terrestrial habitats, flora and fauna, biodiversity and protected areas.
- Socioeconomic Environment - including land use, demography, employment, education, infrastructure, public services and public health etc.
- Cultural Heritage - including designated and potential archaeological sites, monuments and intangible cultural heritage.

Maps supporting this section, presenting baseline information along the TAP route, are included in *Annex 4* of this ESIA. The mapping depicts data for the following baseline topics:

- *Annex 4.1 - Habitats and Protected Areas*
- *Annex 4.2 - Landscape*
- *Annex 4.3 - Soil and Water*
- *Annex 4.4 - Administrative Structures*
- *Annex 4.5 - Health Services*
- *Annex 4.6 - Land Use and Socioeconomic Evironment*
- *Annex 4.7 - Cultural Heritage*
- *Annex 4.8 – Geology*

Additonal material supporting the baseline and the full baseline field survey reports, describing methodologies used and further detail on the survey findings, referenced throughout this section are presented in *Annex6*. The Annex contains the following reports:

- *Annex 6.1 - Baseline Bibliography*
- *Annex 6.2 - Baseline Collection Difficulties and Limitations*
- *Annex 6.3 - Supporting Materials Socio-economic Baseline*
- *Annex 6.4 - Supporting Materials Cultural Heritage Baseline*
- *Annex 6.5 - Supporting Materials Biological Baseline*
    - *Annex 6.5.1 - Flora and Vegetation Baseline Study*
    - *Annex 6.5.2 - Bear Baseline Study*
    - *Annex 6.5.3 - Wolf Baseline Study*
    - *Annex 6.5.4 - European Souslik Baseline Study*
    - *Annex 6.5.5 - Avifauna Baseline Study*
    - *Annex 6.5.6 - Herpetofauna Baseline Study*
    - *Annex 6.5.7 - Hydrobiology Baseline Study*
    - *Annex 6.5.8 - Diatoms Laboratory Report*
    - *Annex 6.5.9 – Golden Jackal Baseline Study*
- *Annex 6.6 - Supporting Materials Physical Baseline*
    - *Annex 6.6.1 - Geology Baseline Report*
    - *Annex 6.6.2 - Groundwater Baseline Study*
    - *Annex 6.6.3 - Soils Baseline Study*

- *Annex 6.6.4 - Landscape Baseline Study*
- *Annex 6.6.5 - Ambient Air Quality Study*
- *Annex 6.6.6 - Ambient Noise Study*

6.2 Physical Enviroment

6.2.1 Overview

This section describes the physical environmental resources of the Project route and its surrounding environment, focused on a Study Area consisting of a 500 m wide corridor (250 m either side of the proposed centre line of the pipeline) along the entire length of the Base Case route. The following elements have been considered:

- geology, seismicity and geomorphology;
- groundwater and surface water;
- climate and ambient air quality;
- acoustic environment; and
- landscape and visual amenity.

The project area, from the Turkish border near Kipoi until Amfitriti, north of Alexandroupolis, comprises of a large flat region with a mean altitude below 150 m that extends to the southwestern part of the Evros basin area containing Evros River tributaries and other streams. Northwest of Alexandroupoli, the Project area stretches up to the southeastern end of the Rhodopi Mountain, into a more mountainous and densely vegetated area reaching an elevation of 500 m. To the west, the landscape is flat and land use is mainly agricultural from Chamilo to Amaranta. This area hosts a variety of vegetation including evergreen scrubland, riparian vegetation, deciduous forest, grasslands and meadows, pastures and agricultural land. At the southeastern end of the Rhodopi Mountain, the forest habitats along the proposed route include mixed broadleaved forest dominated by oak (*Quercus sp.*). Patches of riparian galleries are found along streams throughout the study area.

Further to the west, the project area consists of a large flat expanse comprising of the plains southern of the Rhodope mountainous area. These flatlands located south of the Komotini - Xanthi axis contain the river system of the Bosbos, Aspropotamos, Xiropotamos (Kompsatos)

and Xanthi (Kosynthos) rivers. The project route then crosses the Nestos River and the entire Chrysoupoli plain, reaching Nea Karvali.

After Nea Karvali, the project route then crosses a mountainous segment with forest lands across the Kavala Mountains, reaching an elevation of 700 m. It then follows a segment north of the Paggaio Mountain with cultivated fields where in the past the now dried Marshlands of Philippi were located. The following landscape is hilly, cultivated up to the plain of Serres, with a maximum elevation of 130 m.

Further on, the route crosses the Serres plain and Strymonas River, with its dense irrigation system of ditches and canals. A part of the route follows crossing the woodlands of the Mavrovouni Mountain, with peaks at around 550 m elevation, within the Kroussia Mountain range. From the area of Assiros up to the vicinity of Drymos the route crosses hilly landscapes, meadows and cultivated fields, with an elevation of about 370 m. After that, in the Melissochori – Pentalofos segment, semi-mountainous woodlands are crossed, with an elevation of about 400 m, while the following part up to the end of the route in Nea Mesimvria consists of flatlands with meadows and an elevation of around 70 m, after crossing Gallikos River.

Vermio Mt. lies immediately west of the Thessaloniki - Giannitsa plateau; its highest summit lies above the timberline (above 2,000 masl) nevertheless almost the entire mountain is covered up by dense deciduous forests; pine stands are less common. The western slopes of Vermio Mt. face the Eordea plateau where major urban centres and industrial activities are present.
The Eordaia Plain lies between 400 – 800 masl and is crossed by several tributaries of the Aliakmonas River or streams that flow into the lake systems of the area (Chimaditida, Zazari, Petron and Vegoritida). At the northwest of the Eordea plateau, Vernon (Vitsi) Mt. stands which continues into Askio (Siniatsiko) Mt. to the southeast and further south to Mt. Vourinos.
The summits of both Vernon and Askio mountains rise above 2,000 masl. To the west towards the Greek/Albanian border and south of Kastoria Lake, the landscape is hilly with patches of cultivated land and grasslands as well as streams that flow into the upstream section of Aliakmonas River.

For the needs of the ESIA, the route was divided in the following sections according to the main natural landscape units crossed by the pipeline route:

East Section (KP 0 – 359):

- River Evros Area KP 0 – 13
- Southern Evros KP 13 – 62
- Lowlands of Evros KP 62 – 86
- Komotini – Xanthi Plain KP 86 – 176
- Kavala Mountains KP 176 – 193
- Philippoi Plain KP 193 – 225
- Serres Plain KP 225 – 296
- Kroussia Mountains KP 296 – 329
- Gallikos Plain KP 329 – 359

West Section (KP 359 – 543):

- Axios Plain KP 359 - 425
- Vermio Mountain slopes KP 425 – 466
- Ptolemaida Basin KP 466 – 486
- Askion Mountain slopes KP 486 – 507
- Kastoria-to-border KP 507 – 543

For the description of the natural environment, this division provided a useful tool in order to describe baseline conditions. The distinction between East and West Section is due to the two different development stages of the project. It is reminded that initially only the West Section was studied, from Nea Mesimvria, near Thessaloniki, to the Greek/ Albanian border. TAP AG later on decided on the extension of the project from Nea Mesimvria to the Greek/ Turkey border. For the socioeconomic and cultural heritage baseline, the administrative structures were chosen in order to facilitate competent authorities and the public.

6.2.1.1 Summary of Baseline Collection Activities

A brief summary of field survey activities undertaken to gather current baseline data for the physical environment is provided in *Table 6-1.*

Table 6-1 Summary of Physical Environment Baseline Surveys

Baseline Topic	*Study Area*	*Field Work Activity / Time*
Surface Water	Measurements based on Water Frame Directive took place in 26 pipeline crossings with rivers and streams of permanents flow. Samples were collected upstream and downstream, wherever possible.	June 2011, August/ October 2012, April 2013
Groundwater	86 groundwater abstractions were recorded and also 19 groundwater samples were collected	June 2011, August/ October 2012
Soils	Soil samples were taken from the 23 soil profiles with a maximum depth of 1 m.	July 2011 / September 2012 / November 2012
Geology	Desktop study performed (reports, geological maps).	
Climate	Data of 11 meteorological stations along the pipeline route was used.	
Air Quality	Air sampling took place in proximity of GCS00 and GCS01 area.	November/ December 2012
Noise	Noise measurements were taking place at nearest sensitive receivers close to GCS00 and GCS01.	November 2012
Landscape	A Landscape characterisation for the main landscape units along the route and a Visual Analysis for main vistas regarding above ground structures has been conducted from key viewpoint locations.	August/ October 2012, January/ February 2013, April 2013

Source: ASPROFOS (2013), EXERGIA (2013)

6.2.2 Geology, Seismicity and Geomorphology

6.2.2.1 Geological Conditions

6.2.2.1.1 Regional Overview

Greece forms a part of the Alpine orogen[1] known as Hellenides. The approximately NW-SE striking Hellenides originate from the collision of the Eurasian, Aegean-Anatolian and the African plates. The Hellenides are split into two groups, which are further subdivided into

[1] An 'orogen' is a belt of the earth's crust involved in the formation of mountains. 'Orogeny' is therefore the process in which a section of the earth's crust is folded and deformed by lateral compression to form a mountain range.

several tectonic units. The respective groups are termed Internal Hellenic arc (east) and External Hellenides arc (west).

The Internal Hellenides are composed of the following tectonic units:

- Rhodope Zone;
- Serbo-Macedonian Zone;
- Circum – Rhodope Zone;
- Axios Zone (Divided in 3 sub zones, Almopia, Paiko and Paionia); and
- Pelagonian Zone.

The External Hellenides are composed of the following tectonic units:

- Pindos Zone;
- Parnassos Zone;
- Ionian Zone; and
- Paxoi Zone.

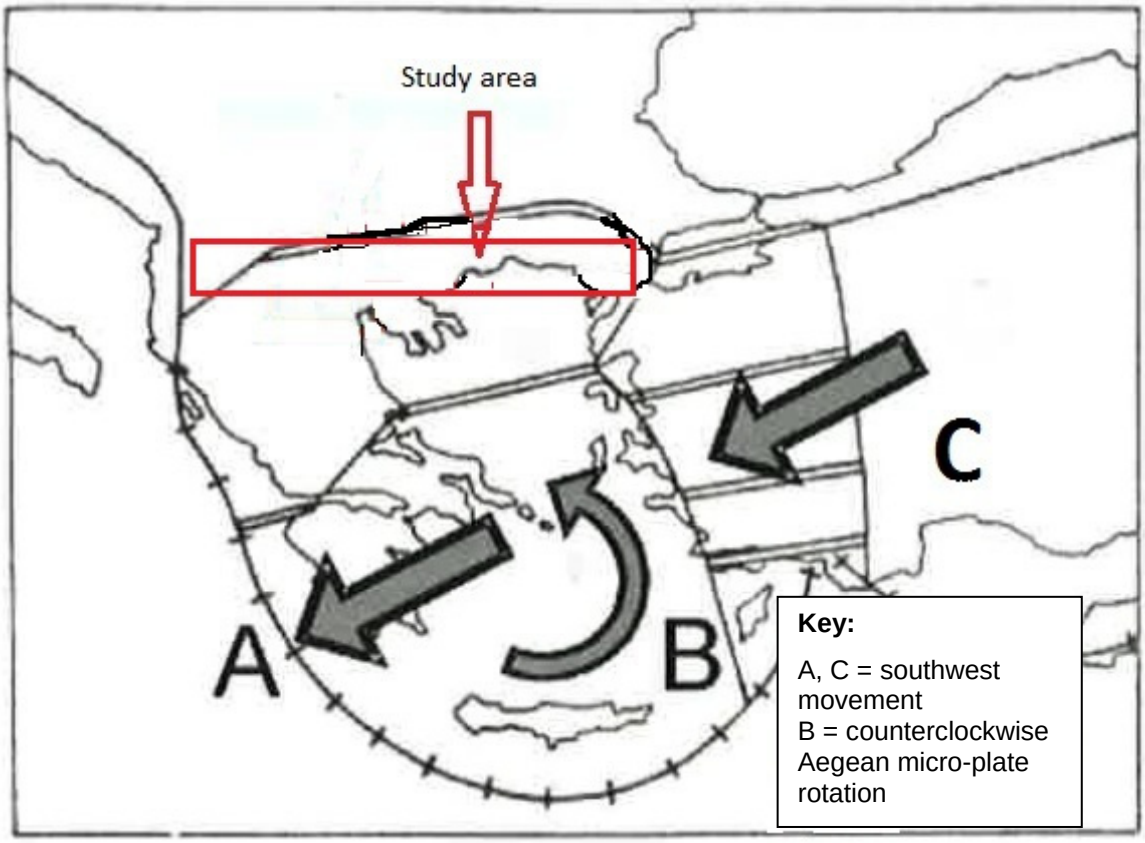
On the Greek mainland and Ionian Islands, all tectonic units are bound by NW-SE striking faults. The overall kinematics show a west–verging movement directed from the core of the Aegean Sea towards the western / southwestern periphery, in the Ionian and Libyan Seas (African plate). The Hellenides suffered two main orogenetic cycles.

The first one occurred in Late Jurassic – early Cretaceous age mainly in the Internal Hellenides. The second one (the main Alpine orogeny) occurred in the early Neogene geological period. It started in late Eocene and culminated during the Oligocene and Miocene epochs. This orogeny is still on-going along the present Hellenic arc and trench system. Geodetic measurements indicate that southwestern Greece is moving to the S-SW at a rate of approximately 30 mm per year. This makes the Aegean region very active in tectonic terms.

The proposed pipeline route crosses the Axios Zone, the Pelagonian Zone and the sub-Pelagonian Zone (the palaegeographic slope to the deeper environment of the Pindos trough) from east to west. However, the current route is located on Neogene and Tertiary sediments deposited on troughs and basins that were originated from late Neogene tectonic events. The orogeny is still active at the Project area, and has generated NE-SW trending normal faults with NW-SE slip vectors.

The tectonic setting in the Project area is considerably influenced by the motion of the Aegean plate in central and southeastern Greece. The Aegean microplate performs a counter clockwise (CCW) rotational motion, which is combined to a southwestern drifting component, as far as it concerns the Internal Hellenides. *Figure 6-1* presents a model of the current tectonic evolution. The pipeline route falls within the red square.

Figure 6-1 Tectonic Model of the Aegean



Source: Thanassoulas & Klentos, 2005 in ILF (2006) Trans Adriatic Pipeline Feasibility Study II, Geological Report Greece, 9564-II/ILF-GEN-PL-REP-005-GR/REV.0, 27/06/2006

The folded mountains in NW Greece and its equivalent in Albania are the result of a continental collision propelled by the westward motion of central Turkey (Anatolia) relative to Eurasia and a roughly N-S trending extension of the Aegean Sea and its coastal regions. In the SW and S of Greece these dynamic forces are taken up by subduction in the Hellenic Trench. Due to this tectonic mechanism, mainland Greece comprises one of the most actively expanding regions today. Stretching rates of 15-20 mm/year are indicated for the active subduction zone of the African plate under the European one.

Thrace

According to the conclusions from studies on the tectonic evolution of the Rhodope mass carried out in various areas, this mass has undergone the influence of three tectonic phases:

- The first phase caused isocline, synmetamorphic folds of N-W axis direction and the first main metamorphism of the rocks of this mass.
- The second phase caused sub-isocline folds, of NE-SW to ENE-WSW axis direction, accompanied by an apparent lineation, resulting in similar orientation of the Rhodope rocks with the axes direction of these structures.
- The third Tertiary age phase caused open folds with NW-SE axis direction, as well as several thrusts and over thrusts to a small extent.

The area extending to the east of Komotini, as well as the wider region of the North Aegean Sea, are characterized by the presence of great neogene-quaternary basins, which follow the N-S to NW-SE (with deviations from NNW-SSE to NNE-SSW) and ESE-WNW to ENE-WSW directions of the most important faults of East Macedonia - Thraki. Marine geophysical and geological surveys implemented over the North Aegean Sea region during various oil investigation projects also proved that the main fault zones also have the same directions. Furthermore, the morphological data of East Macedonia and Thraki rivers basins as well as the development of the hydrographic network, confirm the occurrence and influence of the aforementioned main fault systems.

The most important neotectonic structure of the wider area is the fault zone passing north-west of Komotini, which comprises the boundary of the Rhodope mass and extends up to the Evros valley to the east, as observed in the satellite images and the aerial photos of the area. This fault, estimated to be of 7 km total downthrow (Lyberis, 1984), brings into contact the metamorphic formations of Rhodope with the neogene - quaternary deposits. According to our field observations, its geometric and dynamic characteristics (direction, dip and orientation of the tectonic slickensides) are not the same throughout its length. Mercier et al. (1989) reports that the neotectonic activity of the North Aegean Sea region is defined by the influence of extensional tectonic stresses. The first extensional phase of WNW-ESW direction took place during Upper Miocene and the second of NE-SW direction, during Pliocene-Lower Pleistocene. From Middle Pleistocene to date, the stress field has an approximate N-S direction

East Macedonia

As indicated, mainly by major normal faults, some of which have an downthrow of some hundred meters, the area of Macedonia exhibits, strong tectonism.

Similarly, the presence of deep tectonic grabens (Thessaloniki – Giannitsa - Strymon and others), filled with neogene and quaternary sediments and traversed by large rivers of the North Greece is also characteristic.

The outstanding fault directions affecting the area are NW - SE, NE - SW and E - W.

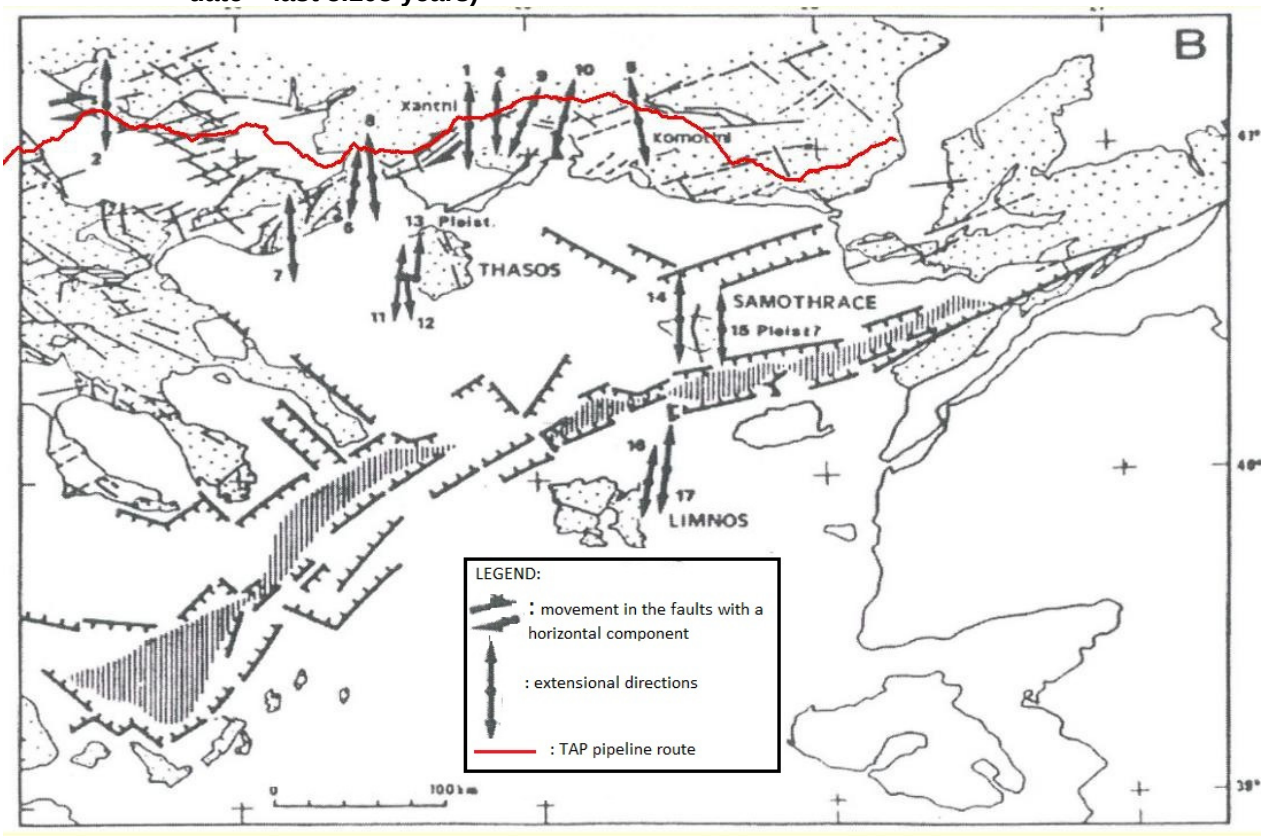
The main movement of these faults, affecting the preneogene basement have contributed to the formation of recent sedimentary basins. The routined tectonic activity has caused the formations of younger faults. In the basins which, in turn, have deformed the recent sediments. The tectonic study has shown that there is strong similarity in the geometrical and dynamic characteristics between the major, and decisive for the area faults, and the numerous minor faults.

Fault kinematic of the wider North Aegean area reveals the effect of three successive tectonic phases. The first phase during the Upper Miocene, had WNW-ESE extensional direction, the second during the Pliocene-Lower Pleistocene was of NE-SW direction and the recent active extensional phase (Middle Pleistocene - present of NNW-SSE direction).

The tectonic movements taken place during the last phase have formed the final morphological image of the area.

The last tectonic phase prevailing at present in the whole North Aegean region, has caused high seismicity resulted in severe earthquakes as those of Ierissos (1932) and Thessaloniki (1978).

Figure 6-2 Simplified tectonic figure of the North Aegean Sea region (Middle Pleistocene to date – last 5.105 years)



Source: Adopted by Mercier et al. 1989

Central Macedonia

The Axios Plain is dominated by the River Axios. The river is 380 km in length, out of which 74 km are within Greek territory.

The River Loudias is actually an artificial canal which was constructed in the 1930's for the drainage of the Lake of Giannitsa. In modern times it formulates a natural drain for the collection of all the surface waters of the area from the foot of the mountain Paiko to the NE, the River Aliakpon and the River Axios.

The main faulting tectonics in the area are related to the Alpine orogeny process during the post Eocene tectonic activity. The tectonic features related to the orogeny processes are the thrusts that have occurred along the normal lithological contacts or elongated faults along the anticlines. Vertical movements and faulting tectonism resulted in the creation of tectonic horsts and troughs creating different palaeogeographical environments. These environments are related to the nature of sediment deposits in the formulated basins; some are lacustrine some

brackish and some of sea origin. These sediments are often interbedded with continental origin materials depending on the speed of sedimentation. These sediments covered the Alpine formations in the study area.

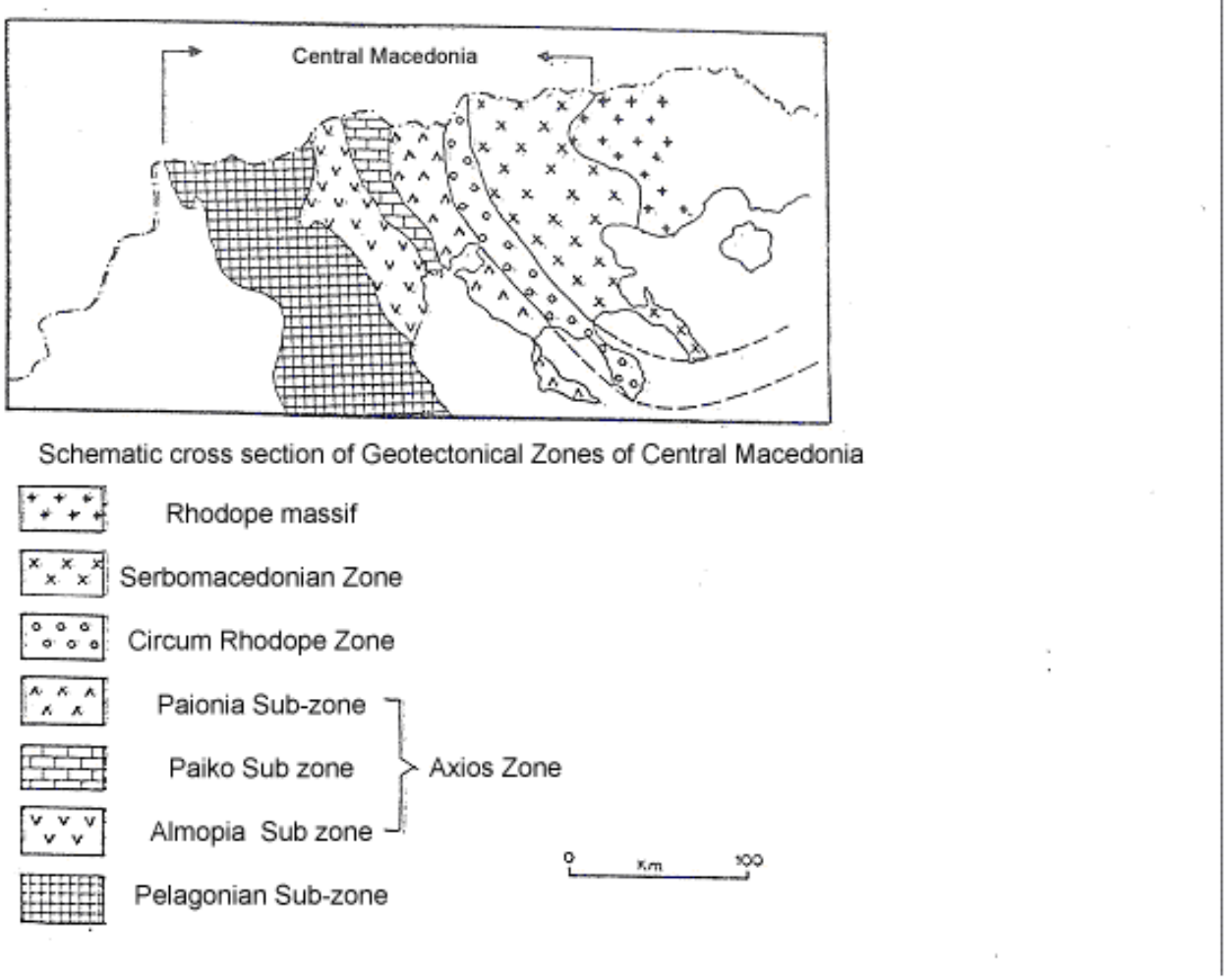
During the Pleiocene and Tertiary periods tensional stress faulting occurred in the area. The most important faults are related to the intense neotectonic and seismic activity originated during the Mid-Upper Miocene continued till current times. Normal neotectonic expansion faults break the continuity of the metamorphic and volcanic rocks of the Axios Zone formations. *Figure 6-3* presents the layout of the geotectonic zones that comprise the geological background (bedrock) of Central Macedonia.

The proposed pipeline route crosses mainly the Axios zone. The three sub zones of Paionia, Paiko and Almopia comprise the broader Axios zone. In the north neighbouring countries, the Axios zone is also referred as Vardar zone. Axios zone is placed between Rhodope massif to the east and Pelagonian zone to the west. It comprises deep sea sediments, mainly ophiolithes. It was tectonised twice, once during Jurassic when the deep-sea trench was closed and also during Eocene when the basins which were later filled with the current sediments were formed.
The division of Axios to the three sub zones was made using lithological and tectonic evidence. This same division is valid if palaeogeographic criteria are applied. Paionia and Almopia areas are related to troughs and Paiko is linked with shallow sea sedimentation.

The Axios – Loudias Plain hosts NE-SW and NW-SE faults, most of which are buried under the recent fluvial and deltaic deposits. The available focal mechanisms in the broader area display normal and oblique-normal faulting along NW-SE and ENE-WSW fault planes. These two fault sets seem to dominate the whole area crossed by the TAP route, from Nea Mesimvria – Aghialos in the east to Skydra – Petraia, in the west.

The western margin of the Giannitsa Plain, as well as the transition to the Aridaia Basin, hosts N-S faults, almost parallel to the alpine tectonic structures. Most of these faults may be associated with the Mio-Pliocene volcanic activity in the area and do not show Quaternary activity. However, some of these structures bear geomorphological characteristics which suggest the continuation of their activity in the Quaternary.

Figure 6-3 Schematic Section of the Geotectonical background of Central Macedonia



Source: Veranis (2010)

West Macedonia

The Ptolemais Basin (KP 466 – 486) was formed in the Pleistocene age, due to extensive fault tectonic events which resulted in the subduction of the area between the cities of Florina (near the Greek – Albanian border) and Kozani (to the south of the pipeline route at Ptolemaida). The Ptolemais Basin also has a great economic significance since it hosts numerous lignite (brown coal) seams which are extracted and used for electricity generation. The morphology of Mount Askio is characterized by smooth ridges with incision of small creeks with fillings of loose materials (scree and talus cones) beside them. After descending through a braided valley system west of Kleisoura the proposed pipeline route reaches the flat basin planes east of Kastoria Lake, where almost flat terrain underlain by alluvial sediments is predominant. Occasionally terrace deposits are crossed.

The surroundings of Kastoria Lake to the border and the upper Aliakmon form a flat land mainly due to the influence of the surface water network. The elevation along this undulating terrain unit peaks at 1,090 m on the Albanian border. But most of the terrain crossed by the proposed TAP route lies below 1,000 m in altitude. The terrain to the Albanian border is predominately made up of gentle hills and ridges featuring wide crests.

Pelagonian and Almopia geotectonic zones comprise the geological background of West Macedonia. The Pelagonian zone comprises crystalline bedrock on which a shallow sea limestone sequence has been tectonically placed. Another Cretaceous similar sequence is tectonically placed on the previous one. This tectonism of Jurassic age is linked to the closure of the Axios trough to the east at that time and it is also linked to the presence of ophiolithes in the region.

The Alpine orogenetic cycle sediments, currently present in trangressive geological contact with the Palaeozoic formations are less folded and slightly crystalline. During the Alpine orogenetic cycle tectonism, the younger geological layers slid on the volcanic rocks. The post Alpine tectonic events are linked with vertical movements and faults of Tertiary age that created the modern geomorphological outlook of the area.

The landform of Mount Vermio is characterized by predominantly wide stretched crests and ridges. Gorges and scarps exist at some locations. The maximum elevation along the route is approximately 1,140 m, north of Ano Grammatiko.

Mount Vermio forms a very complicated tectonic structure. Folding and subsequent thrusts (especially at the east Vermio) and faulting are the main characteristics of this tectonic complex. The north-western margin of Mount Vermio flanks the Lake Vegoritis tectonic depression, which is a part of the Florina – Vegoritis – Ptolemais (FVP) neotectonic basin. Lake Vegoritis occupies the northwestern portion of an asymmetric graben of NNE-WSW strike. The master fault of this half-graben[2] is the NNE-SSW, ESE-dipping Vegoritis fault, which consists of four segments and together with the overlapping Petron fault, which is spaced 5-7 km apart, have formed NW-tilted uplifted footwall block that have separated Ptolemais Basin in the south from Florina Basin in the north. Vegoritis half-graben itself develops obliquely to the strike of the 1st order basin (the FVP) and its master, namesake fault, together with Petron fault and the

[2] A 'half-graben' is a geological structure bounded by a fault along one side of its boundaries.

Proastio fault system in the south postdate the NNW-SSE faults that originally controlled the formation of FVP. These younger faults display noticeable quaternary activity. Several strands of the Peraia fault system intersect the proposed TAP route.

Sediments of the Mesohellenic trench are present in the west of the area. The Palaeozoic background of the Pelagonian zone was influenced from both Caledonian and Erkynian folding which resulted in its unified tectonic manipulation during the Alpine orogenetic circle, helping the younger formations to slide on this background. Plutonic and volcanic activity occurred during the above folding.

The Mesohellenic trench is an elongate intermountain basin stretching from Albania to Thessaly in Greece and its original tectonic grain comprises NW-SE tectonic structures, the continuity of which has been disrupted by younger NE-SW ones. The age of the latter structures must be post-Pliocene and some of these fault zones are currently active, as the Servia fault, which is held responsible for the 1995 (M=6.6) earthquake of Kozani – Grevena. Tectonic lineaments and probable faults of similar strike (NE-SW) are present throughout this stretch of the pipeline route. More detailed information is also given in the published geological map sheets where these faults of NE-SW strike are clearly shown, often truncating occurrences of Mio-Pliocene formations (Nestorion Sheet). Broad-scale geomorphological reconnaissance also suggests the existence of these structures, which may account for the sharp bends of the main branches of the Aliakmon River. The kinematics of all these faults, however, remain more questionable: Neither Moment Tensor Solutions are not available for events from this area, nor field observations from fault outcrops. Therefore, only a conservative estimate can be given and, in view of all the above, it is believed that these structures should display significant horizontal component of movement.

In other words, these faults may be oblique-slip, without ruling out the possibility for strikeslip faults. The kinematics of these structures also depend on their strike: smaller-order faults, which strike more NNE-SSW or even N-S are expected to be closer to pure dip-slip (normal). Neogene, tertiary and Holocene sediments dominate along the proposed TAP route. Solid bedrock lies beneath these sediments, in some cases several hundred meters deep. The solid bedrock has formed basins or trenches which were later filled by the thick sedimentary sequences which are present at the areas of Axios, Loudias and Ptolemaida. In general, the eastern sections of the study region are characterised by ophiolitic bedrock complexes and limestone units, both rather strong and good in rock mass quality. Due to spatially complex

tectonic contacts, these units border to different sedimentary rocks e.g. limestones, sandstones and siltstones further west. These clastic deposits, with some carbonate intercalations, belong to different Flysch units (Tertiary, Cretaceous), are all generally weak and poor in rock mass quality.

Cretaceous and Triassic Jurassic limestones and marbles are found primarily along the Mount Vermion and Mount Askion area. In these geological units, ophiolites also occur which often contain serpentine and gabbros (igneous rocks). In the western part, from Kastoria lake to the Albanian border a thick succession of tertiary sedimentary rocks of the Molasse Zone are of major relevance for the route. The rocks found are predominantly schists and marbles, sandstones, conglomerates and limestones.

6.2.2.1.2 Geological Formations and Geotechnical Characteristics along the route.

A description of the geological formations referring to sections of baseline is presented below:

River Evros Section

This section consists of the Holocenic deltaic deposits of Evros and the molassic deposits of Oligocene and Eocene age. The deltaic deposits mainly consist of fine and mixed phases of sandy clays, silty sands etc.

The molassic formations consist of alternations of clays, marls and fine sandstones with bioclastic banks, lignite horizons and acid tuffs, tuffite, sands etc. General the formations are characterized as loose or weak rocks.

Southern Evros Section

This section consists mostly from volcanic formations such as tuffs, tuffites, andesites, dacitoid andesites, molassic formations and Alpine formations.

Molassic formations that prevail are the ones of Eocene and Oligocene consisting of marls alternating with or passing to sandy marls, sandstones and conglomerates. At the upper sections occur tuffs to tuffites with limestone schill banks.

Alpine formations are schist, quarzites, marly limestones, breccias and they are anticipated at the mountainous part of Kirki Mountains. At the narrow stream's beds Holocene sediments are encountered.

The hard rocky formations consist the 40% of the section. The rest formations are characterized as weak rocky formations.

Lowlands of Evros Section

This section of the flat areas consists mainly of alluvial deposits with a small percentage of volcanic rocks (tuffs – tuffites, andesites) that appear at the beginning of the section. The loose formations cover the 85% of the under investigation Section.

Komotini - Xanthi Plain Section

This section consists of alluvial deposits (loose materials) in percentage 93%. The rest formations are conglomerates and screes.

Kavala Mountains Section

This section consists of marbles and schists in percentage 75%. Marbles of Kavala mountains are lighter and darker grey coloured ones, well or poorly thin stratified in bed or in lenses, locally alternated or interfingered with micaschists. Schists are classified as muscovite – schists with varying parts of quartz and carbonate.

Philippoi Plain Section

This section consists of alluvial deposits in a percentage of 100%.

Serres Plain Section

This section consists of alluvial deposits in percentage 72% and Neogene formations in percentage 21%. There are also marbles in percentage 7% at the karst area of Allistrati Caves.

Kroussia Mountains Section

This section consists of rocky materials in percentage 96%. The rest formations are pleistocenic deposits which are characterized as loose rocky materials. The gneiss that prevails at the mountainous area is dark grey or brown, fine to medium grained monotonous (plagioclase anorthite, quartz, muscovite, biotite, perthitic K-feldspar, epidote, etc). The bedrock is usually covered by eluvial mantle of significant thickness.

Gallikos Plain Section

This section consists of loose materials (alluvial deposits & neogene sediments) in percentage 75%. The rest formations are limestones, schist, conglomerate which are characterized as hard rocky formations of Triassic - Jurassic age and a small appearance of Gabbros of Ophiolitic type. These Alpine rocky formations constitute the mountainous area at the North of Pentalofos - Melissochori and belong to Serbomacedonian zone.

Axios Plain Section

The central part of the Axios Basin consists of continental and fluvial origin quaternary deposits overlying older neogene lacustrine sediments. Marly limestones, marles, sandstones, conglomerates, sands, and clays comprise the sedimentary variety of the Neogene. Holocenic and Pleistocenic deposits of total thickness up to 700 m dominate the southern part of the Axios Valley. Holocene deposits consist of sandy silt, clays and fine sands with occasional intercalations of organic material due to modern swaps. The underlying Pleistocene consists of sediments of marine origin, namely clays interchanged with sand and gravels.

Within the River Loudias catchment, in the area to the south of the town of Giannitsa along the pipeline route quaternary deposits crop out. They consist of fine sands, clays, sandy clays, and clay sands interchanged with layers of loose coarse materials like sands, cobbles and gravels. The Neogene underlies this sedimentary sequence and consists mainly of marls and marly limestones which dominate, in comparison with fewer occurrences of conglomerates and sandstones.

Vermio Mountain Slopes Section

The mountain Vermio consists of:

- Crystalline schists at the base forming the area's geological background;
- Highly karstified marbles of Triassic – Jurassic age of a total thickness of 800 m;
- Serpentines, volcanic rocks of the ophiolithic mélange of Jurassic age;
- Upper Cretaceous limestones or limestone conglomerates;
- Flysch consisting of clay schists and clays.

Ptolemaida Basin Section

This section consists of Tertiary sediments. Interchanging layers of conglomerates with loose and more compacted sandstones, sands, clays of variable composition comprise the general geological pattern of the basin.

Askion Mountain Slopes Section

This section consists of Triassic and Jurassic limestones as the geological background. These are limestones with dolomites, occasionally pure dolomites or dolomitic limestones of variable color (grey, white, white-grey, black). They are very karstified, and very tectonic.

Kastoria-to-Border Area (Meso-Hellenic Trough)

This section consists of Tertiary alluvial, river and lacustrine loose sediments. In more detail, they consist of unconsolidated alluvial and elouvial materials, river terrace deposits, brown yellowish sands, silty sands, sandy silts and swampy areas with silt moist grounds and sands. The river and the lacustrine deposits consist of loose conglomerate and blueish to green clays, sands, loose sandstones and red clays.

6.2.2.1.3 Regional Geological Setting and Tectonics

The geological data for the regional geological setting have been taken from the bibliography of the area taking also into consideration the Technical Route Assessment Report Greece (ILF, 2011) and the Trans Adriatic Pipeline Feasibility study II, Geological Report Greece (ILF, 2006).

A description of the anticipated formations along the route with the excavatability of the unconsolidated deposits and the bedrock is provided in the following table.

The excavability was classified in three classes:

- **Class 1** Unconsolidated deposits, excavation with light tracked excavation machinery possible, DIN classes 1,3 and 4.
- **Class 2** Coarse or consolidated sedimentary rock weathered rock, ripping necessary, excavation with heavy excavation machinery possible, DIN classes 5 and 6.
- **Class 3** Blasting required, DIN class 7.

Table 6-2 Geological Formations along the pipeline route

Section	*Approx. Chainage*	*Geological Formation*	*Geological Age*	*Excavability*
River Evros Section	0 – 13	Holocenic deposits, deltaic deposits, clays, marls, sandstones, tuffs-tuffites and torrent deposits	Holocene Eocene	100% Class 1
Southern Evros Section	13 – 62	Mostly volcanic formations such as tuffs, tuffites, andesites, dacitoid andesites, and rocky formations like schist, quarzites, marly limestones, breccia.	Holocene Eocene Jurassic Cretaceous	40% Class 3 60% Class 2
Lowland of Evros Section	62 – 86	Alluvial deposits, volcanic rocks (tuffs – tuffites, andesites). The loose formations cover the 85% of the under investigation Section.	Holocene Eocene	85% Class 1 10% Class 3 5% Class 2
Komotini – Xanthi Plain Section	86 – 176	Alluvial deposits (loose materials) in percentage 93%. The rest formations are conglomerates and screes.	Neogene, Tertiary, Holocene	99% Class 1 1% Class 2
Kavala Mountains Section	176 – 193	Marbles and schist in percentage of 75%. The rest formations are screes and alluvial deposits.	Paleozoic	75% Class 3 25% Class 1
Philippoi Plain Section	193 – 225	Alluvial deposits	Holocene	100% Class1
Serres Plain Section	225 – 295	alluvial deposits in percentage 72% and Neogene formations in percentage 21%. Marbles in percentage 7%.	Holocene, Neogene, Paleozoic	72% Class 1 21% Class 2 7% Class 3
Kroussia Mountains Section	295 – 329	Rocky materials in percentage 96%. The rest formations are pleistocenic deposits which are characterized as loose rocky materials.	Paleozoic Mesozoic	96% Class 3 4% Class 1
Gallikos Plain Section	329 – 359	alluvial & Neogene deposits in percentage 75%. The rest formations are gneisses, limestones, schist, which are characterized as hard rocky formations	Holocene, Neogene, Jurassic, Triassic	75% Class 1 25% Class 3
Axios Plain section	359 - 425	Marly limestones, marles, sandstones, conglomerates, sands and clays underlying sandy silt, clays, fine sands	Neogene, Tertiary, Holocene	Class 1
Vermio Mountain slopes section	425 – 466	Crystalline schists at the base Highly karstified marbles Serpentines, volcanic rocks of the ophiolithic mélange Limestones or limestone conglomerates Flysch consisting of clay schists and clays	Triassic Jurassic Cretaceous Eocene	Class 3
Ptolemaida Basin section	466 – 486	Interchanging layers of conglomerates with loose and more compacted sandstones, sands, clays	Tertiary	Class 1
Askion Mountain slopes section	486 – 507	Limestones, dolomitic limestones	Triassic - Jurassic	Class 3
Kastoria-to-border area (Meso-Hellenic Trough)	507 – 543	Brown yellowish sands, silty sands, sandy silts, conglomerates and blueish to green clays, sands, loose sandstones and red clays.	Tertiary	Class 2

Notes: the excavability is related to the lithological characteristics and the geological background and is not necessarily applicable to an entire pipeline section.

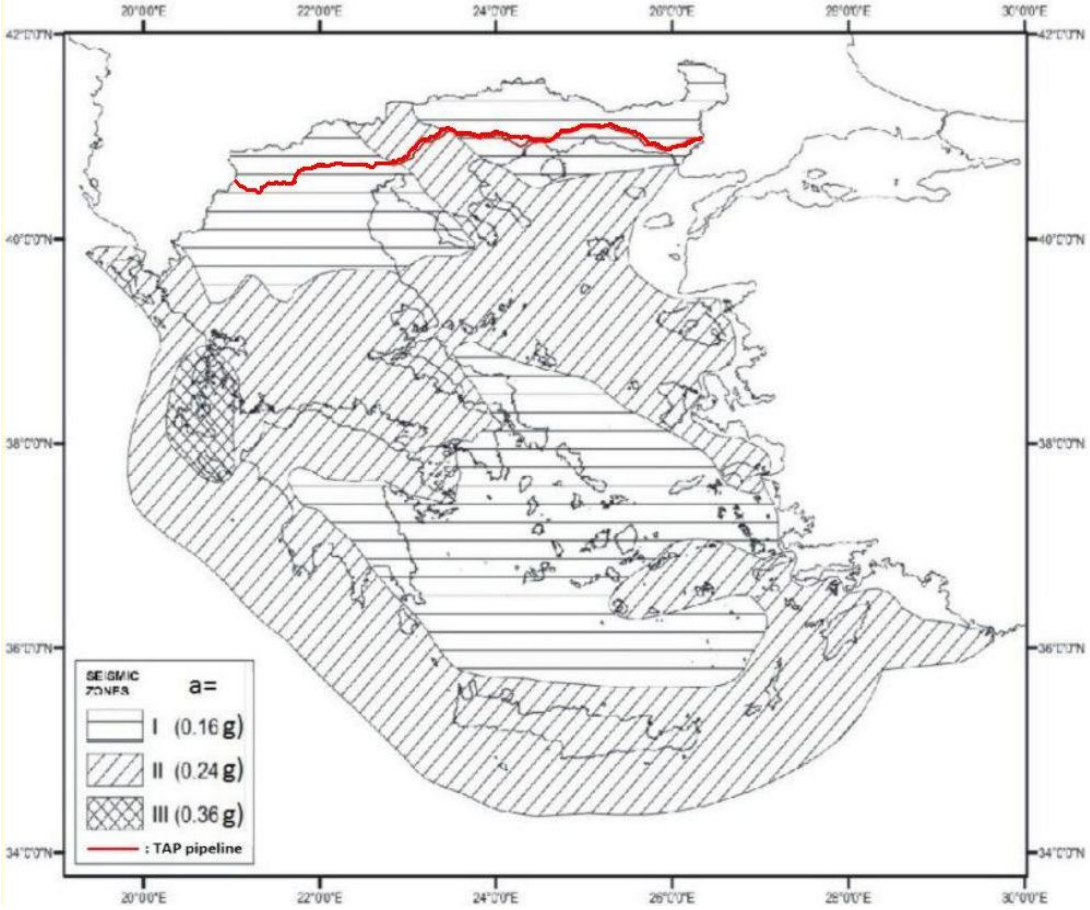
Compiled by: ILF (2011) & ASPROFOS (2013).

6.2.2.1.4 Earthquake Source Zones – Seismicity

According to the Greek Seismic Code & Eurocode 8, the region of Macedonia and Thrace, where the TAP pipeline route passes is classified in two different seismic zones as illustrated on the map in *Figure 6-4* below.

The routing part that starts from the Greek - Turkish Border up to the Strymonas river crosses zone I areas of low seismicity with acceleration a =0.16 g, then up to N. Mesimvria crosses zone II, an area of medium seismicity with acceleration a =0.24 g and the remaining part from Nea Mesimvria to the Greek/Albanian border crosses zone I areas again.

Figure 6-4 Map of the seismic hazard zones of Greece



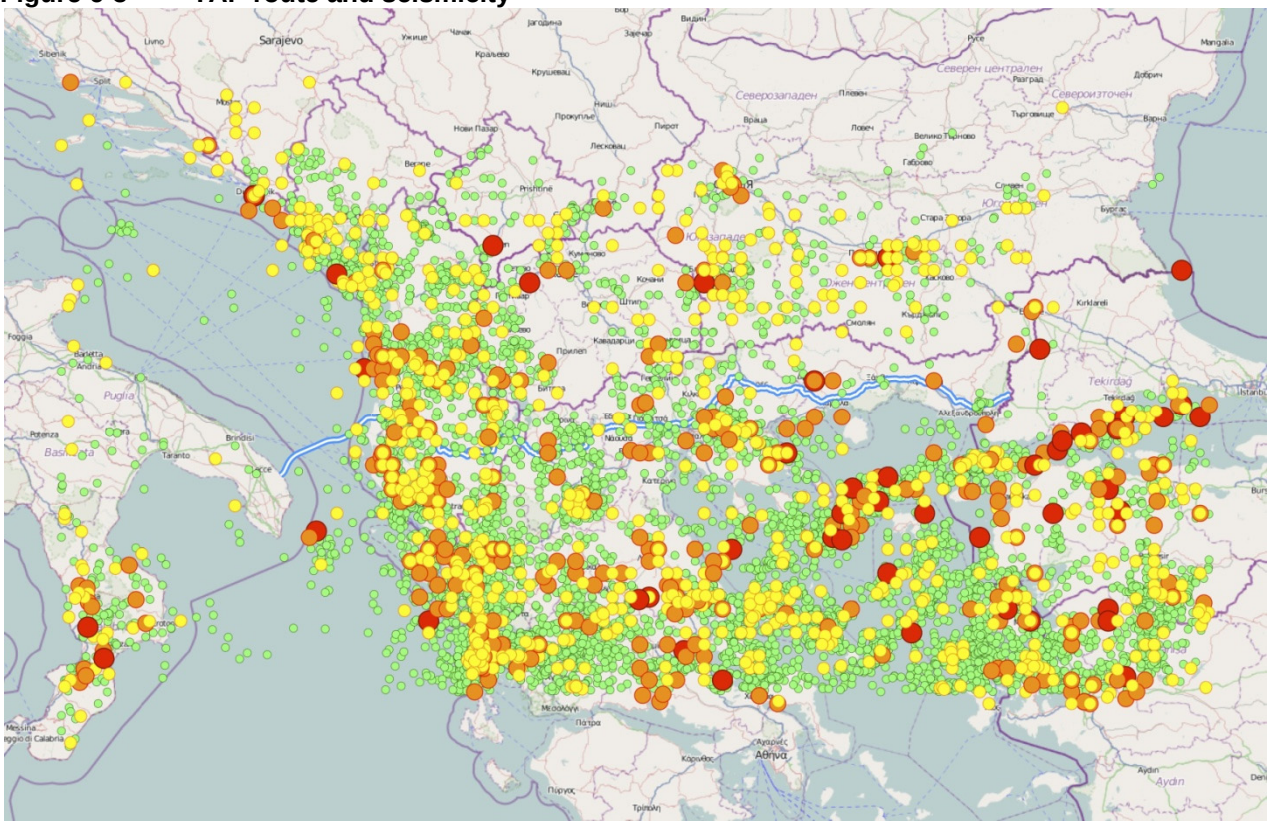
Source: EAK (2000)

The Geodynamic Institute of the National Observatory of Athens has executed a significant number of Seismic Hazard Studies with the aim of determining the seismic design of the Greek N.G. High Pressure Pipeline Network in the region of North Greece.

The TAP route is characterized by a low to moderate seismicity as we can see in the following figure.

Epicentres of the earthquakes with an M_W (moment magnitude scale) larger than or equal to 4.0 in the TAP catalogue. The earthquakes with an M_W 4.0-4.9 are plotted with green symbols. The yellow symbols indicate events with an M_W 5.0-5.9, the orange symbols M_W 6.0-6.9, and the red symbols $M_W \geq 7.0$. The TAP route is reported in blue/white.

Figure 6-5 TAP route and seismicity



Source: OGS (2013) - Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

6.2.2.2 Geohazards

6.2.2.2.1 Landslides and Rockfall

The unpredictability of landslide behaviour refers to the frequency/magnitude of movement episodes and to the style of ground disturbance that can be expected within different parts of the landslide mass. Because of the uncertainties associated with the ground behaviour of

landslides and the difficulties in achieving significant risk reduction without major investment in time and resources avoidance has been therefore considered to be the most appropriate strategy for route selection.

Moreover, it should be taken into account that one of the possible landslides triggering events is ground shaking induced by earthquakes (also referred as seismic loading) which cannot be inhibited by human activity. Further analysis is provided in *Annex 6.6.1*.

6.2.2.2.2 Faults

Earthquakes that result in surface fault rupture are an important consideration for buried pipelines, because pipelines crossing fault zones must be able to deform longitudinally and in flexure to accommodate ground surface offsets.

The faults cutting or enter the pipeline corridor (see *Table 6-3*) are classified as follows:

Class 1: Seismic faults. Faults that are associated with a known historical or paleoseismological earthquake.

Class 2: Possibly active faults. Faults that have sufficient geological and geomorphological evidence to suggest activation since Upper Pleistocene.

Class 3: Neotectonic faults. Faults that affect post-Alpine and pre-Pleistocene rocks, but there are no indications that they have been activated since.

Class 4: Faults with unknown activity. They are mainly basement faults that have no characteristics that can be used to date their recent activity.

The following table refers to the total anticipated faults along Tap Routing according to the relevant Study[3].
Further analysis is provided in *Annex 6.6.1* and known faults along the TAP route are shown in *Annex 4.3*.

[3] Department of Geology, A.U.Th., Faulting in the TAP pipeline buffer zone, Part of the environmental report Dr. Alexandros Chatzipetros, 31.03.2013

Table 6-3 Faults list across the pipeline route.

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
1	0.6	NW-SE	NE	Quaternary (?)	3.9	Probable normal fault	Defines the contact between Oligocene sediments and Evros basin.	3
2	4.5	NE-SW	NW	Oligocene	1	Probable high angle normal fault, 2 km NE of Peplos	Oligocene sediments	3
3	4.7	NE-SW	NW	Oligocene	1.3	Probable high angle normal fault, 1.6 km NE of Peplos	Oligocene sediments	3
4	5.4	WNW-ESE	n/a	Upper Eocene	0.7	Vertical fault, 1 km NE of Peplos	Cuts through members of the Upper Eocene sequence	3
5	6.7	NE-SW	NW	Miocene	2.6	Normal fault, 1 km NW of Peplos	Mainly in Upper Eocene volcanics; in one site it defines the contact between volcanics and Miocene sandstone	3
6	7.8	NW-SE	n/a	Upper Eocene	1.6	Probable vertical fault, 1.7 km NW of Peplos	Cuts through members of the Upper Eocene sequence	3
7	8.7	NW-SE	n/a	Upper Eocene	3	Vertical fault, 2.3 km W of Peplos	Cuts through members of the Upper Eocene sequence	3
8	9.3	NW-SE	n/a	Upper Eocene	3	Vertical fault, 2.8 km W of Peplos	Cuts through members of the Upper Eocene sequence	3
9	9.9	WNW-ESE	SSW	Miocene	1.7	Normal fault, 3.3 km W of Peplos	Mainly in Upper Eocene volcanics; in one site it defines the contact between volcanics and Miocene sandstone	3
10	11.4	NW-SE	SE	Quaternary	2	Small normal fault, 1.6 km NNW of Ardanion	Mainly in Upper Eocene volcanics; in two sites it defines the contact between volcanics and Pleistocene conglomerate	3

[4]Fault ID numbers.
[5]General strike at the point of intersection or projection of intersection.
[6]Dip direction. n/a: refers to vertical faults, where dip direction is meaningless.
[7]Inferred age of last reactivation, based on geological evidence (youngest rocks affected).
[8]Length of the specific segment (in km).
[9] Class 1: seismic fault. Class 2: possibly active fault. Class 3: neotectonic fault. Class 4: unknown activity

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
11	12.1	NW-SE	n/a	Upper Eocene	0.7	Vertical fault, 1.6 km NW of Ardanion	Cuts through members of the Upper Eocene sequence	3
12	12.9	NW-SE	SE	Quaternary	6.6	Normal fault, its SE tip terminating at Ardanion	In places it defines the contact between Upper Eocene volcanics and Pleistocene conglomerate, although it is presumed buried at its greatest part	3
13	14.3	NNE-SSW	n/a	Upper Eocene	1.3	Vertical fault, 0.8 km E of Kavisos	Cuts through members of the Upper Eocene sequence	3
14	15.3	N-S	n/a	Upper Eocene	0.7	Vertical fault, 0.4 km E of Kavisos	Cuts through members of the Upper Eocene sequence	3
15	16.5	NE-SW	n/a	Upper Eocene	0.9	Vertical fault, 0.7 km W of Kavisos	Cuts through members of the Upper Eocene sequence	3
16	17.0	NW-SE	n/a	Upper Eocene	1.6	Vertical fault, 1 km SW of Kavisos	Cuts through members of the Upper Eocene sequence	3
17	17.9	NE-SW	n/a	Upper Eocene	2.6	Vertical fault, 1.5 km SW of Kavisos	Cuts through members of the Upper Eocene sequence	3
18	18.2	NW-SE	SE	Upper Eocene	3.2	High angle normal fault, 2 km WSW of Kavisos	Segment of a larger, 7.7 km long fault zone. Cuts through members of the Upper Eocene sequence	3
19	20.2	NNW-SSE	n/a	Upper Eocene	0.7	Vertical fault, 1.8 km SE of Pylea	Cuts through members of the Upper Eocene sequence	3
20	20.6	NE-SW	n/a	Upper Eocene	0.6	Vertical fault, 1.7 km SE of Pylea	Cuts through members of the Upper Eocene sequence	3
21	20.9	NE-SW	n/a	Upper Eocene	1	Vertical fault, 1.6 km SSE of Pylea	Cuts through members of the Upper Eocene sequence	3
22	23.9	NE-SW	SE	Upper Eocene	8.9	Normal fault, passing through Pylea	Separates Upper Eocene marl and sandstone alternations from limestone	3
23	25.4	NE-SW	SE	Upper Eocene	2.6	High angle normal fault, 3.2 km NE of Loutros	Upper Eocene marl and sandstone alternations	3

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
24	26.8	NNE-SSW to NE-SW	ESE to SE	Neogene	4.8	Normal fault, terminating at Loutros	Probable or buried normal fault that defines the elongated morphological depression, through which Tsai torrent is flowing. It is buried beneath Holocene alluvial sediments	3
25	26.9	NW-SE	n/a	Pre-Neogene	1.1	Almost vertical normal fault, 850 m NE of Pefka	Defines the contact between several members of the volcanic sequence	3
26	29.6	NW-SE	n/a	Pre-Neogene	3	Almost vertical normal fault, its SE tip terminating in Loutros	Defines the contact between several members of the volcanic sequence	3
27	30.0	NE-SW to N-S	SE to E	Eocene	6.3	Normal fault, its northern tip terminating 400 E of Nipsa	Defines the contact between several members of the volcanic sequence	3
28	30.8	NW-SE	NE	Pre-Neogene	2.8	Normal fault, 700 m NE of Aetochorion	Defines the contact between several members of the volcanic sequence	3
29	31.6	NE-SW	NW	Oligocene	2.3	Normal fault at Aetochorion	Fault defining the contact between Middle Eocene limestone and Oligocene sandstone	3
30	46.6	NNE-SSW to NE-SW	WNW to NW	Eocene	4.8	Normal fault	Basement fault for more of its length, but it defines the border of a small intramountain basin filled with Middle Eocene conglomerates	4
31	49.7	NE-SE	n/a	Pre-Neogene	1.8	High angle normal fault	Basement fault	4
32	50.6	NE-SW	n/a	Pre-Neogene	1.7	High angle normal fault	Basement fault	4
33	51.0	NE-SW	n/a	Pre-Neogene	0.8	High angle normal fault	Basement fault	4
34	58.9	NW-SE	n/a	Pre-Neogene	2.3	High angle normal fault	Basement fault	4
35	62.0	N-S	W	Pre-Neogene	7.2	High angle normal fault	Basement fault	4
36	95.0	NE-SW	n/a	Neogene	11.9	High angle normal fault	Basement fault	3
37	101.3	NE-SW	n/a	Neogene	13.3	High angle normal fault	Basement fault	3

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
38	121.2 & 122.4	WNW-ESE to ENE-WSW	S	Probably Quaternary	30	This continuation of the Kavala-Xanthi-Komotini fault zone does not cross the pipeline route, but on this segment the route runs parallel and at a distance of up to 1 km from it	Variable. It generally divides the Paleozoic basement of Rhodope Massif to the NW from the sedimentary basin sequences to the SE.	1 - 2
39	175.8	NE-SW	SE	Historical	40	This basin-bounding fault is a segment of the large Kavala-Xanthi-Komotini fault zone. For a length of *about* 17 km, the pipeline route runs parallel to this zone and at a distance of up to 1 km from it	Variable. It generally divides the Paleozoic basement of Rhodope Massif to the NW from the sedimentary basin sequences to the SE.	1 - 2
40	236.9	NE-SW	SE	Pleistocene	5.3	High angle normal fault, passing through Lefkothea	Probable or buried fault in Miocene marl and Pleistocene sediments	3
41	243.3	NW-SE	SW	Pliocene	2.6	High angle normal fault, 1.5 km SW of Nea Zichni	Probable fault partly in Miocene-Pliocene marl and sandstone and possibly buried under Pleistocene sediments	3
42	*	NE-SW		Pre-Neogene	3.5	Normal fault	Basement fault	4
43	*	NE-SW	SE	Pre-Neogene	2.1	Normal fault	Basement fault	4
44	*	NNE-SSW	WNW	Pleistocene	3.7	High angle normal fault	Defines the contact between Paleozoic amphibolitic gneiss and Pleistocene conglomerates	3
45	311.1	NNE-SSW	ESE	Pleistocene	2	High angle normal fault	Defines the contact between Paleozoic amphibolitic gneiss and Pleistocene conglomerates	3
46	346.7	N-S	E	Pre-Neogene	4	High angle fault. Evolves into a high angle reverse fault towards the north	Defines the contact between Lower Jurassic shale and Middle Triassic carbonates	4

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
47	349.7	NE-SW	NW	Pliocene	1.7	Low angle normal fault	Buried under Miocene-Pliocene sediments (inferred)	3
48	*	NE-SW	n/a	Pliocene	3.9	Vertical fault, 500 m NW of Agios Athanasios	Cuts Miocene-Pliocene sediments	3
49	*	NE-SW	n/a	Pliocene	1.3	Vertical probable fault, crossing the NW outskirts of Gefyra	Cuts Miocene-Pliocene sediments	3
50	366.1	NE-SW	n/a	Pliocene	2.8	Vertical fault, 700 m NW of Gefyra	Cuts Miocene-Pliocene sediments	3
51	426.5	NW-SE	SW	Possibly Pliocene-Pleistocene	2	Low-angle normal fault	Almost entirely basement fault. Near its SE tip it defines the contact between basement and Pl-Pt sediments	3
52	427.1	NW-SE	n/a	Pre-Neogene	1.5	Vertical fault	Basement fault	4
53	429.0	NE-SW	n/a	Pre-Neogene	2.2	Vertical fault that evolves into a low-angle reverse structure to the N, outside the buffer zone	Basement fault	4
54	429.6	N-S	W	Pre-Neogene	2.6	Complex fault zone, comprised of small segmented faults	Basement fault	4
55	429.9	NNW-SSE	n/a	Pre-Neogene	2.2	Part of a fault zone, comprised of small segmented faults	Basement fault	4
56	*	NNW-SSE	ENE	Pre-Neogene	2.8	Thrust fault that forms part of the Vermion nappes	Basement fault	4
57	*	NE-SW	n/a	Pre-Neogene	1.6	Part of a complex zone with small segmented faults. The total length of the zone is *about* 4 km	Basement fault	4
58	*	E-W to NE-SW	S to SE	Pre-Neogene	4.8	Thrust fault, part of a tectonic window	Basement fault	4
59	437.6	NW-SE	NE	Post-Alpine	0.6	Almost vertical normal fault, 1.9 km NE of Ano Grammatiko	Mostly basement fault. At its southern tip it seems to define the contact between Cretaceous carbonates and alluvial deposits	3

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
60	438.7	NW-SE	NE	Pre-Neogene	2.4	Reverse fault, related to fault #58. They are part of the same zone that define one of Vermion nappes. It extends to the south through Ano Grammatiko	Basement fault	4
61	*	NE-SW	n/a	Pre-Neogene	1.9	Vertical fault, *about* 800 m ENE of Kato Grammatiko	Basement fault	4
62	*	NE-SW	n/a	Pre-Neogene	1.3	Vertical fault, *about* 1.5 km ESE of Kato Grammatiko	Basement fault	4
63	*	NE-SW	NW	Pleistocene	1.4	High angle normal fault, 1.4 km S of Kato Grammatiko	Defines the contact between different basement rocks. At its SW tip it defines the contact between basement and Pleistocene lateral scree	2
64	442.8	NNE-SSW	WNW	Quaternary	2.7	Normal fault, 100 m east of Kato Grammatiko	At its northern half, it defines the contact between basement and the alluvial deposits of Grammatiko torrent. Despite that, it is unfavorably oriented to the active stress field	2
65	445.4	NW-SE	NE	Pleistocene	1.9	High angle normal fault, 2.1 km SW of Kato Grammatiko	In parts, it defines the contact between Triassic-Jurassic marble and Pleistocene scree.	2
66	446.3	NE-SW	NW	Pleistocene	1.4	High angle normal fault, 2.4 km WSW of Kato Grammatiko	In parts, it defines the contact between Triassic-Jurassic marble and Pleistocene scree	2
67	446.3	NW-SE	SW	Pleistocene	1.5	High angle normal fault, 3.5 km WSW of Kato Grammatiko	In parts, it defines the contact between Triassic-Jurassic marble and Pleistocene scree	2

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
68	447.6	NE-SW	NW	Pleistocene	0.8	High angle normal fault, 2.3 km N of Pirgi	In parts, it defines the contact between Triassic-Jurassic marble and Pleistocene scree	2
69	*	NE-SW	SE	Quaternary	4.2	High angle normal fault, 1.1 km SE of Maniaki	It is part of the *about* 10 km long Perea-Maniaki fault zone.	2
70	*	ENE-WSW	NNW	Pre-Neogene	1.8	High angle normal fault, 1.7 km N of Antigonos	Basement fault	4
71	457.8	ENE-WSW	n/a	Unknown	0.6	Vertical probable fault, 1 km W of Antigonos	Unknown	4
72	*	NNE-SSW	ESE (?)	Unknown	8.6	High angle normal fault, passing through Filotas	Unknown, fault buried under the Pliocene-Pleistocene sedimentary sequence	3
73	*	N-S to NE-SW	E to SE (?)	Unknown	6.2	High angle normal fault, its south tip terminating at Perdikkas	Unknown, fault buried under the Pliocene-Pleistocene sedimentary sequence	3
74	472.5	NE-SW	SE (?)	Unknown	11.7	High angle normal fault, passing through Perdikkas	Unknown, fault buried under the Pliocene-Pleistocene sedimentary sequence	3
75	473.2	NE-SW	SE (?)	Unknown	10.7	High angle normal fault, its NE tip terminating at Perdikkas	Unknown, fault buried under the Pliocene-Pleistocene sedimentary sequence	3
Faults #72 to 75 form a *about* 25 km long fault zone that defines the northern boundary of Ptolemais basin. There is no indication that this fault zone has been reactivated after Pleistocene at the crossing sites. However, elsewhere along the Vegoritis-Ptolemais fault zone Quaternary sediments are been delimited by the fault zone. Based on far-field observations, these faults may be classified as class 2 faults, but there is no sufficient evidence at the area of TAP crossing.								
76	*	NE-SW to NNE-SSW	NW to WNW-ESE	Pliocene	8	Normal fault 4.5 km NW of Ptolemaida	Mostly buried under the Pliocene-Pleistocene sedimentary sequence. In the area of Aerofolies torrent it surfaces as a tectonic contact between two Pliocene members of the sequence	3

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
77	478.7	NE-SW	NW	Unknown	9	Normal fault, at the eastern outskirts of Droseron	Unknown, buried under Pleistocene lateral scree.	3
78	484.0	ENE-WSW to NE-SW	SSE to SE	Unknown	3.5	Normal fault, 2 km N of Foufas	Unknown, buried under Pleistocene lateral scree. It probably is the marginal fault between the bedrock and the basin	3
79	*	NE-SW to NW-SE	SE to NE	Pre-Neogene	2.1	Curved fault, 1 km W of Foufas	Basement fault	4
80	*	NE-SW	n/a	Pre-Neogene	2.5	Vertical fault, 1.4 km SE of Varikon	Basement fault	4
81	487.5	NE-SW	n/a	Pre-Neogene (as segment), Quaternary (as part of a larger zone)	1.8	Vertical fault, 1.1 km NE of Varikon	Basement fault. In its northeastern projection it seems to be associated with a large NE-SW trending and NW dipping fault zone, defining Lake Himaditis southern shoreline	2
82	489.2	NE-SW	SE	Unknown	1.5	Almost vertical fault, 0.6 km N of Varikon	Unknown. It is buried under alluvial sediments. It seems to be the boundary between the Paleozoic gneiss to the NW and the small Varikon basin to the SE. It is possibly associated to a large NE-SW trending fault zone that runs between Varikon and Lake Petron	3
83	*	NNW-SSE	n/a	Pre-Neogene	2.1	Vertical fault, 1.6 km SE of Lehovo	Basement fault	4
84	*	NE-SW	NW	Pre-Neogene	3.3	High angle normal fault, 1 km SE of Kleisoura	Basement fault	4
85	*	NW-SE	n/a	Pre-Neogene	1.2	Vertical fault, 0.7 km E of Kleisoura	Basement fault	4
86	*	ENE-WSW	n/a	Pre-Neogene	1.1	Vertical fault, 1.4 km N of Kleisoura	Basement fault	4
87	*	NNE-SSW	WNW	Pre-Neogene	2	Normal fault, 1.3 km WSW of Kleisoura	Basement fault	4
88	*	NW-SE	n/a	Pre-Neogene	3.3	Vertical fault, 0.4 km NE of Lithia	Basement fault	4

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
89	*	WNW-ESE	n/a	Pre-Neogene	1	Vertical fault, passing through Lithia	Basement fault	4
The area between faults #84 and 89 is comprised by Paleozoic crystalline basement, which is crisscrossed by vertical faults that are all class 4 faults, hence of no importance to the project. Not all of them are described in this table.								
90	*	NE-SW	n/a	Pre-Neogene	0.8	Vertical fault, 0.5 km WSW of Korissos	Basement fault	4
91	*	NW-SE	n/a	Pre-Neogene	0.3	Vertical fault, 1.4 km WSW of Korissos	Basement fault	4
92	*	NE-SW	n/a	Pre-Neogene	0.3	Vertical fault, 2.1 km WSW of Korissos	Basement fault	4
93	*	NW-SE to NNW-SSE	SW to WSW	Pre-Neogene	1.7	Normal fault, 1.5 km WNW of Dispilio	Basement fault, separating ophiolites from Triassic-Jurassic rocks	4
94	530.0	NE-SW	NW	Unknown	3	High angle normal fault, passing through Mesopotamia	Probable fault, associated with a *about* 9.2 km long fault zone that runs between Mesopotamia and Kranochori	3
95	531.2	NE-SW	n/a	Quaternary	4.1	Vertical fault, 1.2 km NW of Mesopotamia	Probable fault, associated with a confirmed *about* 18 km long fault zone of the same strike.	2
96	*	E-W	S	Post-Miocene	1.7	Steep normal fault, passing through Aghia Kyriaki	Covered fault, probably marking the boundary between Miocene sandstone to the north and the Pleistocene basin to the south	3
97	534.2	NE-SW	SE	Post-Miocene	3	Steep normal fault, passing through Aghia Kyriaki	Covered fault, probably marking the boundary between Miocene sandstone to the NW and the Pleistocene basin to the SE	3
98	534.8	NW-SE	n/a	Post-Miocene	2.2	Vertical fault, 1.5 km NE of Oinoi	Entirely in Miocene sandstone	3
99	*	NW-SE	n/a	Post-Miocene	0.7	Vertical fault, 1.9 km NNE of Oinoi	Entirely in Miocene sandstone	3
100	*	NNW-SSE	n/a	Post-Miocene	0.9	Vertical fault, 0.2 km N of Oinoi	Entirely in Miocene sandstone	3

ID[4]	KP	S[5]	D[6]	A[7]	L[8]	Description	Lithology	Class[9]
101	537.7	NNE-SSW	WNW	Post-Miocene	1.6	Steep normal fault, 0.8 km NNW of Oinoi	Separates Miocene sandstone from Miocene marl/sandstone	3
102	*	NW-SE	n/a	Post-Miocene	2	Vertical fault, 2.8 km N of Oinoi	Entirely in Miocene sequences	3
103	540.2	NE-SW	SE	Post-Miocene	2.2	Steep normal fault, 2.4 km NE of Polianemo	Separates Miocene sandstone from Miocene marl/sandstone	3
104	540.7	NE-SW	n/a	Post-Miocene	1.5	Vertical fault, 2 km NE of Polianemo	Entirely in Miocene sequences	3
105	*	WNW-ESE	SSW	Post-Miocene	1.4	Steep normal fault, 2.2 km NE of Polianemo	Separates Miocene sandstone to the N from Miocene marl/sandstone to the S	3
106	*	NW-SE	n/a	Post-Miocene	2.8	Vertical fault, 2 km SW of Ieropigi	Entirely in Miocene sequences	3
107	541.8	NE-SW	n/a	Post-Miocene	1.2	Vertical fault, 2.5 km SW of Ieropigi	Entirely in Miocene sequences	3
108	*	E-W	n/a	Post-Miocene	1.5	Vertical fault, 1.4 km WSW of Ieropigi	Entirely in Miocene sequences	3
109	*	E-W	n/a	Post-Miocene	1.4	Vertical fault, 1.7 km W of Ieropigi	Entirely in Miocene sequences	3
After fault #97, the Miocene molassic sediments of the Meso-Hellenic Trench are crisscrossed by a multitude of short, class 3 faults, that are insignificant for the scope of the project. Not all of those faults are presented in this table.								

*Note: The symbol * implies that these faults do not cross the pipeline route.*
Source: Department of Geology, A.U.Th., Faulting in the TAP pipeline buffer zone, Part of the environmental report, Dr. Alexandros Chatzipetros, 31.03.2013

6.2.2.2.3 Soil Liquefaction

Soil liquefaction is a secondary earthquake phenomenon which can endanger pipeline integrity. The potential for soil liquefaction is site dependent. Liquefaction is most likely to occur in water saturated, relatively uniform fine sands or coarse silts in a loose state. Such underground conditions are bound to certain combinations of geomorphologic setting, sedimentary regime and seismic exposition.

The crossings with the rivers Lisous, Bosbos, Nestos, Strymonas, Gallikos and Axios are susceptible to liquefaction; shallow groundwater levels are expected.

6.2.2.2.4 Karst Areas

Karst is a landform which develops in soluble rocks by the enlargement of discontinuities through flowing groundwater (ultimately to form caves). In well-developed karst the voids and caves can be large and wide enough to carry all the natural drainage. Most karst in the world is formed in limestone rocks and marble which is its metamorphic equivalent. There is less karst on gypsum rocks, which occur to a smaller extent at the earth's surface, and very little on other even more soluble rocks. Gypsum is much more soluble than limestone, and karst will therefore develop more rapidly on gypsum than on limestone. The major engineering significance of karst is the existence of underground cavities, which can cause ground subsidence or sudden collapse. Often, but not always a distinctive suite of landforms is formed at the terrain surface (e.g. closed depressions with no outlets for surface drainage, disorganised topography, etc.).

Alistrati Cave Area (KP 225 to 230) is already known as karst area. The routing passes through limestone area, at the North of the known protected area of Alistrati's cave.
The Mount Vermio (KP 425 - 442) and Mount Askio slopes (KP 486 - 517.5) comprise limestone karst rocks and are classified as karst areas.

6.2.2.3 Summary of Geological Characteristics

Table 6-4 summarises the key findings on the geomorphological, geological and tectonic features.

Table 6-4 Geological Characteristics along the Pipeline Route

Section Approx Chainage	***Landform***	***Geology***	***Geohazards***	***Faults / Seismic Activity***
River Evros Section (KP 0 - 13)	The route runs from the eastern shore of the Evros through cultivated flat areas covered by river sediments	Holocenic deposits, deltaic deposits, clays, marls, sandstones, tuffs - tuffites and torrent deposits	River floodplain crossing: This river constitutes an area of potential soil liquefaction	12 Normal Neotectonic faults at Peplos and Ardanio area do not present indication of recent activity
Southern Evros Section (KP 13 – 62)	At the Vicinity of Ferres and of Alexandroupolis the pipeline route up to the 43th km crosses smooth cultivated areas and one forest mountainous section of about 4 km near Pefka village. In the next section, up to the kilometric position of 65 km it passes through the forest and mountainous terrain of the mountains of Kirki with an altitude of around 500 m. .	Mostly volcanic formations such as tuffs, tuffites, andesites, dacitoid andesites, and rocky formations like schist, quarzites, marly limestones, breccia. At the lowlands, alluvial deposits.	At the mountainous passages of the segment slope stability problems could be occurred during and after the construction. Special care must be taken and further slope stability investigation must be executed at the area of the passage of Pefka where the volcanic -postvolcanic formations usually present landslide danger. Also special care must taken at Kirki mountains area where the route must follow direction vertical to the contour.	The 17 Normal Neotectonic faults at Kavissos, Pilea, Aetochori and Pefka-Loutros area define the contacts between several members of the volcanic series and do not present indication of recent activity. There are also 6 faults which as classified as faults of unknown activity
Lowland of Evros Section (KP 62 – 86)	The route crosses flat cultivated areas at the Komotini - Sappes basin	Alluvial deposits, volcanic rocks (tuffs – tuffites, andesites). The loose formations cover the 85% of the under investigation Section.	At the flat areas of the segment there is not any slope stability danger. The danger of potential liquefaction phenomenon has to be examined especially at the beds of the crossed streams where saturated soil conditions are expected.	No faults

Section Approx Chainage	***Landform***	***Geology***	***Geohazards***	***Faults / Seismic Activity***
Komotini – Xanthi Plain Section (KP 86 – 176)	The route crosses a lot of significant rivers as Bosbos, Aspropotamos, Xeropotamos, Xanthis and finally the river Nestos and the plain of Chrysoupolis, reaching the area near the city of Nea Karvali.	Alluvial deposits (loose materials) in percentage 93%. The rest formations are conglomerates and screes.	Similar conditions with the above segment of the route. The danger of potential liquefaction phenomenon has to be examined especially at the beds of the crossed rivers. High aquifer also expected at the area.	The continuation of the Kavala – Xanthi - Komotini fault zone does not cross the pipeline route, but on this segment the route runs parallel and at a distance of up to 1 km from it. It generally divides the Paleozoic basement of Rhodope Massif to the NW from the sedimentary basin sequences to the SE. This continuation is classified as seismic to possible active.
Kavala Mountains Section (KP 176-193)	Route crosses mountainous areas along ridges with forest lands reaching an altitude of 700 m.	Marbles and schists in percentage of 75%.The rest formations are screes and alluvial deposits.	Potential slope stability issues especially at the Schist formations. Special care must be taken and further slope stability investigation must be executed at the area.	No faults
Philippoi Plain Section (KP 193 – 225)	The route passes north of Pageo Mountain, crossing smooth cultivated areas along the boundary of the area where the dried swamps of Philippoi existed in the past.	Alluvial deposits	The route passes at the boundary of the Philippoi Plain of the dried Swamps. Potential danger of organic turf content at the clayey soil could create instability conditions at the foundation of the pipeline. High aquifer is also anticipated.	No faults
Serres Plain Section (KP 225 – 295)	The route passes through the hilly farmlands until the valley of Strimon. At the next part, the route crosses the plain of the river Strymon which contains a dense system of ditches and irrigation canals.	Alluvial deposits in percentage 72% and Neogene formations in percentage 21%. Marbles in percentage 7%.	The route passes at the boundaries of a karst area for a length of 5 km near Alistrati Cave. At the plain of Strymon the potential liquefaction has to be examined. The area also presents high aquifer.	There are 2 Normal Neotectonic faults at Nea Zichni and Lefkothea vicinity with Pleistocene and Pliocene age and no indications of recent activity.

Section Approx Chainage	***Landform***	***Geology***	***Geohazards***	***Faults / Seismic Activity***
Kroussia Mountains Section (KP 295 – 329)	The route crosses mountainous and rocky area covered by dense forest up to 310 KP, where the route passes near Lachanas city. The following section up to the area of Assiros (329 KP) is hilly cultivated areas.	Gneiss formations together with small granite and amphibolites appearances. Rocky materials in percentage 96%. The rest formations are pleistocenic deposits which are characterized as loose rocky materials.	The Gneiss formations of the area characterized by deep weathering with the effect of the thick elluvial mantles. This could occure to potential instability phenomena. So special care must be taken at the area in order to avoid land slide or instability areas.	There is one Neotectonic fault in the segment which defines the contact between Gneiss and Pleistocene sediments.
Gallikos Plain Section (KP 329 – 359)	From the area of Assiros up to the vicinity of Drimos, the route crosses hilly lands, meadows and cultivated areas. Then in the Melissochori - Pentalofo Section, the route crosses mountainous forest terrain. The Gallikos river bed is crossed next following up to the end, by flat areas with meadows.	Alluvial & Neogene deposits in percentage 75%. The rest formations are gneisses, limestones, schists, which are characterized as hard rocky formations.	At the limestones existence of karst areas has to be examined. Liquefaction examination must be executed at the vicinity of Galikos River bed.	There is one fault of unknown activity and one Neotectonic fault buried under sediments.
Thessaloniki - Giannitsa Plain (KP 359 - 425)	The route crosses flat, respectively slightly undulating terrain and one small island-like rising in the south of Skydra city. No rugged, dissected landforms have to be traversed by the pipeline route within this section.	Tertiary (Upper Miocene - Lower Pliocene) Red clay series; The area is characterized by fluvial sediments like sand and sandy to silty clays, locally gravel components, conglomerates and grits can be found.	Axios floodplain crossing: This river constitutes an area of potential soil liquefaction	1 Neotectonic faults at Axios valley with Pliocene age and no indications of recent activity.

Section Approx Chainage	***Landform***	***Geology***	***Geohazards***	***Faults / Seismic Activity***
Vermio Pass (KP 425 - 442)	This segment is characterized by a pediment plain consisting of minor risings and depressions. The depressions are usually filled with scree and debris. At the flanks of the risings exist sometimes terrace like features.	Tertiary (Neogene-Pliocene); The geology varies from solid volcanic rock agglomerates with lava components in sandy detritus to clay and sandy clay material. Some rounded pebbles of metamorphic rocks with sandy clay cement can be found. In course of the route lithology changes to fine-grained serpentine and compact rock of jurassic and Triassic gabbros and cretaceous marbles, schists and massive limestones alternating with zones of sandy, marly "flysch" and areas of fine grained alluvial deposits.	Limestone karst terrain has to be expected along some alignment sections. Furthermore potential landslide areas in the south of the suggested route and landslide terrain in the north of the corridor, as well as shallow soil creep were investigated.	11 Pre-Neogene basement faults of unknown recent activity and 6 Normal high-angle faults (Kato Grammatiko area) classified as possibly active.
Eastern Margin of Florina, Vegoritis (KP 442- 466)	A pediment plain consisting of minor risings and depressions. The depressions were formed by tectonic processes and are usually filled with scree and debris. At the flanks of the risings exist sometimes terrace like features which are made up of fine grained loose alluvial deposits and debris.	Quaternary (Holocene); Basically alluvial quartenary (Holocence) loose and partly cemented deposits locally containing considerable amounts of fine sediments. Interlayered sequences of bedded marble with schists intercalations are frequent.	Limestone karst terrain has to be expected along some alignment sections. A Landslide prone area is provided north of the route.	1 high-angle Normal fault classified as possibly active and 2 minor faults of unknown recent activity.

Section Approx Chainage	***Landform***	***Geology***	***Geohazards***	***Faults / Seismic Activity***
Ptolemais Basin (KP 466 - 486)	This respective plain features only a few gentle risings and thus has a very uniform geo-morphological character. The underground is predominately made up of young sedimentary deposits.	Pleistocene deposits of fluviatil-lacustrine sediments of various grained sand layers and more or less consolidated material of old scree, talus cones and alluvial fans. These layers are mostly covered by eluvial deposits from weathering of the underlaying formations. Locally loose conglomerates and red loams, rarely yellow-red clays can be found.	Due to the flat terrain landslides and landslide prone terrain are not expected to be very common terrain unit	1 vertical fault at Variko area classified as possibly active, 4 Neotectonic faults with no indications of recent activity.
Mount Askio Pass Kastoria Plains (KP 486 - 517.5)	The main morphology around Mount Askion and Mount Korissos is characterized by smooth mountain ridges with incision of small creeks, gently inclined terraces, stream beds and talus cones. After a valleysystem west of Kleisoura a flat basin underlain by alluvial sediments is predominant.	Pelagonian Basement (Paleozoic) consisting of crystalline schists with alternations of amphibole schists and mica-schists and and thin horizonts of finegrained gneisses are frequent. The last part of this sequence is mainly dominated both by quartenary alluvial and terrace deposits, consisting of sand, sandy clays, gravel and cobbles and older scree and talus cones.	Only a small surficial landslide was encountered. In some parts shallow eluvial covers are possibly affected by soil creep.	1 Neotectonic fault north of Variko with no indications of recent activity.
Aliakmon River Terraces (KP 517.5 - 535)	The contemporary Aliakmonas floodplain lies a few tens of m below the edge of the terrace. In between the terraces and the incised alluvial plain occur steep cliffs. The top of the terrace is almost flat respectively slightly undulating.	Recent alluvial deposits of Aliakmonas River such as silt, sand, and rounded gravel. Quartenary fluvial and lacustrine terrace deposits, loose conglomerates, sandstones and conglomerates with red clays in the upper parts. Those alternate with marls and clastic limestones in the western domain of the tertiary Tsottilon fm. They are covered by thin eluvial soil	Liquefaction prone terrain because of saturated, relatively uniform, fine grained deposits in a loose state. Very high liquefation potetial.	3 Neotectonic faults with no indications of recent activity and 1 posibly active fault northwestern of Mesopotamia.

Section Approx Chainage	Landform	Geology	Geohazards	Faults / Seismic Activity
KP 535 - 543	The terrain is predominately made up of gentle hills and ridges featuring wide crests. Most of the terrain crossed by the TAP lies below 1000 m in altitude.	Tertiary marls to sandy marls, sandstones and clastic limestones. The rockhead is overlain by a thin residual detritus cover. Quartenary alluvial deposits and fluvial terraces of coarse components and underground consisting of unconsolidated material. In some parts basal sandstone series consisting of micaceous sandstone banks, cohesive spheres and clayish marls are present.	The underground is made up of easily weathering, rippable bedrock. Moreover some sections of the corridor along a ridgeline is flanked by eroded landslides which are anticipated to be instable. Mainly erosion prone terrain partly affected by shallow soil creep and slope instability.	6 Neotectonic faults of Post-Miocene age and with no indications of recent activity.

6.2.3 Subsurface and Soils

6.2.3.1 Field Survey Effort

During the field survey soil samples were taken from 23 soil samples[10] along the pipeline route. The project team was excavating an area of 0.1 m^2 at a depth of approximately 40 cm and then the soil sample was extracted by using a small plastic, digging device from the entire profile of 0 – 30 cm. The soil sampling locations were selected to characterise typical conditions spread along the TAP route and at planned above ground structures based on the following criteria:

- Geological data;
- Bioclimatic zones;
- Precipitation;
- Vegetation;
- Land use;
- Observed signs of disturbance and pollution;

[10] 5 soil profiles in the Section Kipoi – Komotini;
7 soil profiles in the Section Komotini – Thessaloniki; and
11 soil profiles in the Section Nea Messimvria to the Greek – Albanian borders.

- Proposed location of the compressor station and
- Floodplain areas.

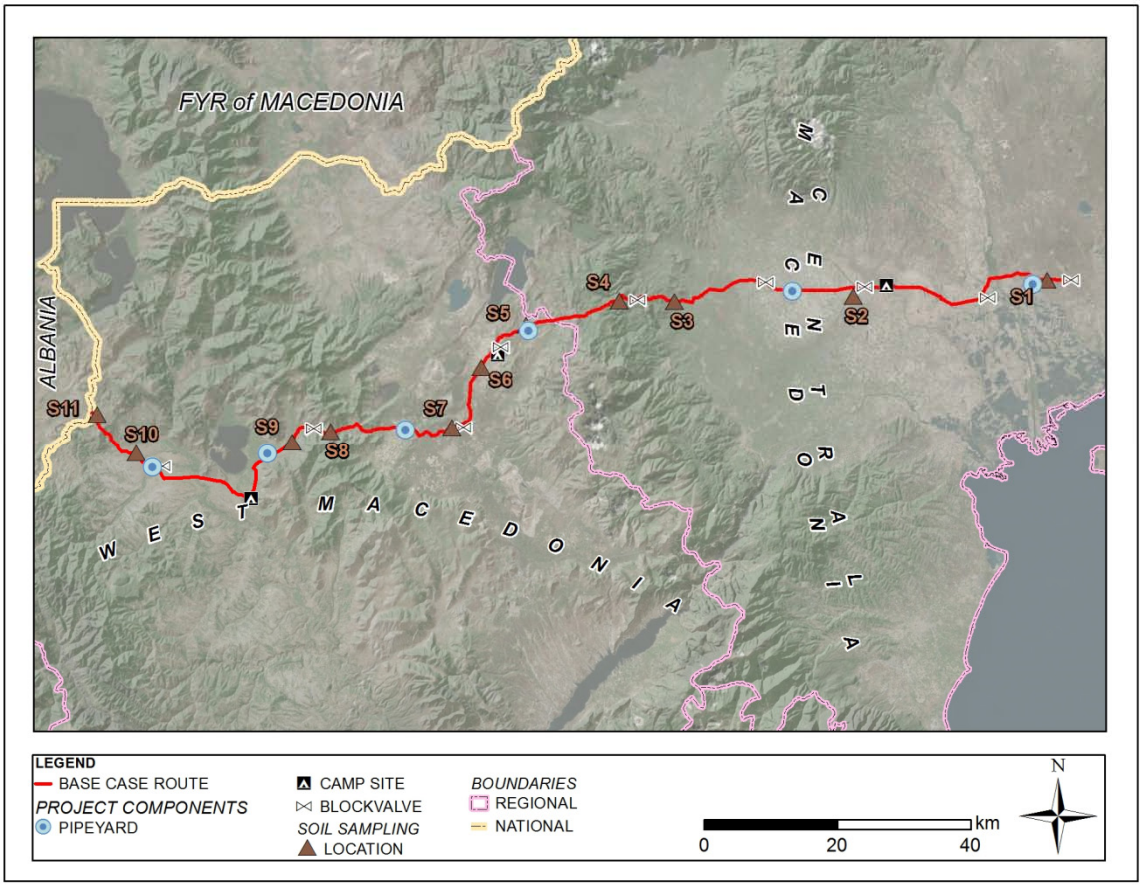
Soil maps from the Ministry of Agricultural and the Joint Research Centre, IES, SOIL action were also used to inform the final selection of sampling locations. The locations sampled are shown in *Figure 6-6* and *Figure 6-7.* More detailed maps are available in *Annex 4.3 Soil and Water*.

Figure 6-6 Soil Sampling Locations (East Section) KP 0-359



Source Exergia and HCMR (2012)

Figure 6-7 Soil Sampling Locations (West Section)



Source: ERM (2011)

Along the pipeline route, from each soil profile, the soil properties (texture, drainage, structure and acidity) were determined at a depth of approximately 30 cm. Additionally, physical and chemical properties of soils (2 of the samples in the section Kipoi – Komotini, 13 samples in the section Komotini – Thessaloniki and 3 of the samples in the west section.) were analysed in the laboratories *(see Annex 6.6.3).*

6.2.3.2 Main Soil Types along the Pipeline Route

The dominant soil types along the pipeline route are presented in *Table 6-5.*

Table 6-5 Dominant Soil Types along the Pipeline Route

Section	*KP*	*Dominant Soil Type*
River Evros area (KP 0.0 – 13.0)	0.0 – 0.4	CalcaricFluvisol
	0.4 – 4.5	Calcaro-vertic Cambisol
	4.5 – 13.0	Calcaro-vertic Cambisol
Southern Evros (KP 13.0 – 62.0)	15.0 – 40.2	Calcaro-vertic Cambisol
	40.2 – 43.2	Calcaro-vertic Cambisol
	43.2 – 45.3	Calcaro-vertic Cambisol
	45.3 – 58.7	EutricCambisol
	58.7 – 62.0	EutricCambisol
Lowlands of western part (KP 62.0 – 86.0)	62.0 – 62.3	EutricCambisol
	62.3 – 75.3	Calcaro-vertic Cambisol
	75.3 – 81.6	CalcaricFluvisol
	81.6 – 86.0	Calcaro-vertic Cambisol
Komotini – Xanthi Plain (KP 86.0 – 176.0)	86.0 – 93.2	Chromic Luvisol
	93.2 – 104.3	Calcaric Fluvisol
	104.3 – 131.8	Eutric Cambisol
	131.8 – 133.5	Dystric Leptosol
	133.5 – 140.7	Chromic Luvisol
	140.7 – 142.3	Calcaric Fluvisol
	142.3 – 144.3	Chromic Luvisol
	144.3 – 146.4	Calcaric Fluvisol
	146.4 – 153.0	Chromic Luvisol
	153.0 – 156.0	Rocks Outcrops
	156.0 – 157.5	Chromic Luvisol
	157.5 – 160.2	Calcaric Cambisol
	160.2 – 176.0	Rocks Outcrops
Kavala Mountains (KP 176.0 – 193.0)	176.0 – 179.3	Rocks Outcrops
	179.3 – 180.3	Calcaric Fluvisol
	180.3 – 193.0	Rocks Outcrops
Philippoi Plain (KP 193.0 – 225.0)	193.0 – 201.7	Rocks Outcrops
	201.7 – 203.7	Rhodric Luvisol
	203.7 – 205.9	Calcaric Fluvisol
	205.9 – 206.3	Rhodric Luvisol
	206.3 – 225.0	Calcaric Fluvisol
Serres Plain (KP 225.0 – 295.0)	225.0 – 226.2	Calcaric Fluvisol
	226.2 – 230.1	Calcaro – Vertic Cambisol
	230.1 – 264.7	Calcaric Cambisol
	264.7 – 295.0	Calcaric Fluvisol
Kroussia Mountains (KP 295.0 – 329.0)	295.0 – 295.4	Calcaric Fluvisol
	295.4 – 297.1	Calcaric Regosol
	297.1 – 315.9	Chromic Luvisol
	315.9 – 329.0	Dystric Regosol
Gallikos Plain (KP 329.0 – 359)	329.0 – 331.0	Dystric Regosol
	331.0 – 337.5	Rhodric Luvisol
	337.5 – 339.7	Dystric Regosol
	339.7 – 341.7	Rhodric Luvisol
	341.7 – 341.9	Dystric Regosol
	341.9 – 342.2	Rhodric Luvisol
	342.2 – 350.6	Dystric Regosol
	350.6 – 359	Vertic – Calcic Luvisol

Section	*KP*	*Dominant Soil Type*
Axios Plain (KP 359 – 425.4)	359.0 – 418.0 418.0 – 425.4	Calcaric Fluvisol Calcaric Cambisol
Vermio Mountain Slopes (KP 425.4 – 466.0)	425.4 – 427.2 427.2 – 441.2 441.2 – 448.2 448.2 – 451.5 451.5 – 455.7 455.7 – 463.4 463.4 – 466.0	Calcaric Cambisol Calcaric Leptosol Rocks Outcrops Calcaric Leptosol Rocks Outcorps Calcaric Fluvisol Vertic Calcic Luvisol
Ptolemais Basin (KP 466 – 486.1)	466.0 – 486.1	Vertic Calcic Luvisol
Askion Mountain slopes (KP 486.1 – 506.9)	486.1 – 488.5 488.5 – 496.9 495.9 – 506.9	Vertic Calcic Luvisol Dystric Leptosol Calcaric Fluvisol
Kastoria to border (KP 506.9 – 543.2)	506.9 – 512.2 512.2 – 541.0 541.0 – 543.2	Calcaric Fluvisol Chromic Vertisol Calcaric Fluvisol

Source: Compiled by ASPROFOS (2013), HCMR (2012), Exergia (2012) and ERM (2011)

6.2.3.3 Areas of Potential Soil Contamination

Nitrate

Elevated nitrate concentrations in soil are likely along the following sections of the pipeline route based on agricultural land use and information provided by HCMR.

Table 6-6 Potential elevated nitrate concentrations along the pipeline route

Section	*KP*
River Evros	KP 0.0 – 13.0
Southern Evros	KP 13.0 – 27.0; KP 32.5 – 36.2; KP 38.9 – 42.2
Lowlands of Western Part	KP 64.7 – 86.0
Komotini – Xanthi Plain	KP 93.2 – 100.0; KP 110.0 – 115.0; KP 135.0 – 137.4; KP 148.5 – 155.0
Kavala Mountains	KP 188.5 – 193.0
Philippoi Plain	KP 193.0 – 225.0
Serres Plain	Not expected
Kroussia Mountain	KP 302.0 – 329.0
Gallikos Plain	KP 329.0 – 359.0

Section	*KP*
Axios Plain	KP 367.8 – 417.8
Vermio Mt Slopes	KP 455.5 – 466.0
Ptolemaida Basin	KP 466.0 – 475.1; KP 478.5 – 484.5
Askion Mountain Slopes	Not expected
Kastoria to border	KP 512.0 – 534.0

Source: Compiled by ASPROFOS (2013), HCMR (2012), Exergia (2012) and ERM (2011)

The above mentioned areas are prone to nitrate contamination because of:

- shallow water table,
- river systems,
- intensive farming practices,
- excessive use of fertilizers (particularly nitrogen based fertilizers).

Nitrate-nitrogen not taken up by crops or immobilized by bacteria into soil organic matter or converted to atmospheric gases by denitrification can leach out of the root zone and potentially end up in groundwater. Higher nitrate contamination in Greek soils is detected at soil depths of 0 - 30 cm and in field crop cultivations (mainly annual crops like corn, cotton, tobacco, other). Between 30 - 60 cm such contamination is detected at much lower levels (by approx. 70%) depending on the crop.

Perennial crops (fruit orchards) and grapes are not characterized as heavy fertilized crops but the amount of chemical inputs they receive are diverse, based on spray programs applied, season and year, weather conditions and the type of fruit trees. Over-use of agricultural chemicals in the area is reported but not quantified, particularly those used for plant protection purposes. Farmland used for biofuel crops (i.e. sunflower and rapeseed) has gradually increased on the plains of Alexandroupoli, Avdira, Giannitsa and Eordea in the past few years. Due to the fact that such crops are not destined for edible uses, chemical inputs are not as stringently controlled.
The 'Kastoria to border' section of the pipeline route, is mostly dominated by field crops (winter grains and scattered forage irrigated crops and many acres of set-aside) which comparatively receive less chemical inputs from other intensively cultivated crops elsewhere along the corridor (i.e. Giannitsa Plain).

The most intensively irrigated crops with high agri-chemical input absorption are found between KP 527.2.5 - 529 (field vegetables and irrigated crops of high value). These regions are involved in projects to reduce nitrate contamination, which are co-financed by EU and Greek Government. However, the Government of Greece has reportedly suspended financial support currently putting such denitration programs on hold.

Heavy Metals

The following table presents the areas that heavy metals contamination is potentially encountered based on histrorical and/or current land use and provinence.

Table 6-7 Potential for elevated concentrations of heavy metals along the pipeline route

Section	*KP*	*Sources*
River Evros	KP 16.0 – 21.0	Active quarries
Southern Evros	KP 46.0 – 60.0 KP 60.0 – 62.0	Weathering of parent materials and redistribution in the soil profile by soil-forming processes.
Lowlands of Western Part	KP 83.0 – 87.1	Industrial facilities
Komotini – Xanthi Plain	In the area of KP 99.8, KP 104.2, KP 135.9 and KP 154	Extensive use of various insecticides, intensive agriculture, organic fertilizers, rock erosion, mining and wastewater disposals.
Kavala Mountains	In the area of KP 180	The geological formation.
Philippoi Plain	In the area of KP 203	Extensive use of fertilizers and the geological formation
Serres Plain	In the area of KP 242, KP 279	Extensive use of various insecticides and intensive agriculture.
Kroussia Mountain	In the area of KP 305	Inactive mines.
Gallikos Plain	In the area of KP 358 and KP 363	Various insecticides, intensive agriculture and organic fertilizers
Ptolemaida basin	KP 466.0 – 486.0	Mining activities, air borne deposition and the acid soils of the region contribute to the mobilization of heavy metals.
Kastoria to border	KP 506.9 – 543.2	Ferronickel mines.

Source: Compiled by ASPROFOS (2013), HCMR (2012), Exergia (2012) and ERM (2011)

6.2.3.4 Analytical Results

In total 12 soil sampling locations were selected and one soil sample of each location analysed in a laboratory for defined suite of chemical parameters.

The two soil profiles of the Section Kipoi – Komotini, selected to determine the soil physical and chemical properties through laboratory analysis (Agrolab S.A.) were sampled in November 2012, and correspond to sampling points S1- E and S3- E (refer to *Figure 6-6*). At sampling location 1 there are agricultural lands and also is the predetermined location of the Compressor Station GCS00. At sampling location 3 there are forest soils and controlled pasture. Also, the diversity of soil acidity is very common at this section.

The seven soil profiles of the Section Komotini – Thessaloniki, selected to determine the soil physical and chemical properties through laboratory analysis (HCMR laboratory and Andreou A. Labs S.A.) were sampled in November 2012, and correspond to sampling poits S6-E, S7-E, S8-E, S9-E, S10-E, S11-E and S12-E.

The three soil profiles of the Section Thessaloniki to the Greek / Albanian border, selected to determine the soil physical and chemical properties through laboratory analysis (Agrolab S.A.) were sampled in June 2012, and correspond to sampling points S2, S7 and S11 (refer to *Figure 6-7*). The profile from sample point S2 was selected to gain knowledge on the agricultural soils derived from sediments of the drained 'Giannitsa Lake', which is crossed by the pipeline for about 50 km. The profile from sample point S7 was selected because agricultural soils at that area are likely to be affected by nearby active lignite mines and thus likely to have high concentrations of contaminants. An identical approach was used in the selection of sample point S11, which corresponds to agricultural lands likely to have high concentrations of contaminants due to the nearby presence of active ferronickel mines.

The laboratory analysis included the determination of soil texture, the available forms of the pH, Total $CaCO_3$, Organic Matter, Specific Electrical Conductivity, Magnesium (Mg), Potassium (K), Sodium (Na), Calcium (Ca), Manganese (Mn), Iron (Fe), Antimony (Sb), Arsenic (As), Berillioum (Be), Cobalt (Co), Mercury (Hg), Selenium (Se), Tin (Sn), Titanium (Ti), Vanadium (V), Zinc (Zn), Copper (Cu), Lead (Pb), Chromium (Cr), Nickel (Ni), Cadmium (Cd), Total hydrocarbons, Aliphatic hydrocarbons, Total PAHs and Total PCBs. Results for the selected sample points are presented in the following table. The text below provides a summary of the analytical results for each sampling point.

Table 6-8 Analytical Results of the Soil Samples

Analytical Results of the Soil Samples														
Parameter	***Units***	***Screening Values (according to the New Dutchlist)***	***Intervention Values (according to the New Dutchlist)***	***S1 - E***	***S3 - E***	***S6 - E***	***S7 - E***	***S8 - E***	***S9 - E***	***S10 - E***	***S11 - E***	***S12 - E***	***S2***	***S7***	***S11***
				KP 3.3	***KP 57.0***	***KP 99.8***	***KP 104.2***	***KP 135.9***	***KP 154.0***	***KP 180.0***	***KP 270.0***	***KP 357.4***	***~KP 395.0***	***KP 472.0***	***~KP 542.0***
				Soil Depth: 0 – 25 cm	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***
Sand	%	-	-	19,300	45,300	41,370	84,780	78,620	83,200	52,620	73,160	61,610	17,300	57,300	17,300
Silt	%	-	-	34,000	38,000	37,900	12,300	15,310	11,760	31,700	15,930	19,510	30,000	22,000	44,000
Clay	%	-	-	46,700	16,700	20,730	2,930	6,070	5,030	15,650	10,910	18,870	52,700	20,700	38,700
pH	pH Units	-	-	6,600	4,600	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	7,800	7,700	7,700
Total $CaCO_3$	%	-	-	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	18.500	0.400	0.200
Organic Matter	%	-	-	2,200	2,200	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	3.970	1.310	1.600
Specific Electrical Conductivity	mS/cm	-	-	1,500	1,150	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	1.070	0.300	0.230
Magnesium (Mg)	mg/kg d.s.	-	-	657,000	142,000	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	398,000	179,000	356,000
Pottasium (K)	mg/kg d.s.	-	-	330,000	80,000	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	248,000	113,000	105,000
Sodium (Na)	mg/kg d.s.	-	-	52,000	40,000	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	36,700	28,700	14,400
Calcium (Ca)	mg/kg d.s.	-	-	402,000	3,690	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	5,590.000	2,222.000	3,242.000
Manganese (Mn)	mg/kg d.s.	-	-	688,000	1	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	18.400	19.700	16.420
Iron (Fe)	mg/kg d.s.	-	-	3,920.00	48,152.00	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	33.200	7.100	11.700
Antimony (Sb)	mg/kg d.s.	-	-	Not Available	Not Available	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	Not Available	Not Available	Not Available
Arsenic (As)	mg/kg d.s.	29.000	55.000	Not Available	Not Available	7,000	3,000	8,000	5,000	21,000	5,000	17,000	Not Available	Not Available	Not Available
Berylliom (Be)	mg/kg d.s.	-	-	Not Available	Not Available	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	Not Available	Not Available	Not Available
Cadmium (Cd)	mg/kg d.s.	0.800	12.000	**1,000**	**1,600**	0.560	0.170	0.280	0.220	0.280	0.470	0.310	0.046	0.034	0.025
Cobalt (Co)	mg/kg d.s.	9.000	240.000	Not Available	Not Available	**10,000**	**11,000**	**14,000**	8,000	7,000	7,000	**12,000**	Not Available	Not Available	Not Available
Chromium (Cr)	mg/kg	100.000	380.000	87.800	48.100	74,000	75,000	**115,000**	59,000	39,000	39,000	92,000	< 0.020	< 0.020	< 0.020

Analytical Results of the Soil Samples

Parameter	***Units***	***Screening Values (according to the New Dutchlist)***	***Intervention Values (according to the New Dutchlist)***	***S1 - E***	***S3 - E***	***S6 - E***	***S7 - E***	***S8 - E***	***S9 - E***	***S10 - E***	***S11 - E***	***S12 - E***	***S2***	***S7***	***S11***
				KP 3.3	***KP 57.0***	***KP 99.8***	***KP 104.2***	***KP 135.9***	***KP 154.0***	***KP 180.0***	***KP 270.0***	***KP 357.4***	***~KP 395.0***	***KP 472.0***	***~KP 542.0***
				Soil Depth: 0 – 25 cm	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***
	d.s.														
Mercury (Hg)	mg/kg d.s.	0.300	10,000	Not Available	Not Available	**0.680**	0.010	0.010	0.010	0.020	0.150	0.010	Not Available	Not Available	Not Available
Nickel (Ni)	mg/kg d.s.	35,000	210,000	**119,000**	16,900	30,000	18,000	**55,000**	22,000	12,000	14,000	34,000	5,800	1,200	2,300
Lead (Pb)	mg/kg d.s.	85,000	530,000	6,600	4,900	34,000	16,00	25,00	28,000	31,000	37,000	25,000	2,900	0.410	0.740
Copper (Cu)	mg/kg d.s.	36,000	190,000	9,300	11,200	**42,000**	25,000	32,000	10,000	24,000	28,000	20,000	3,400	0.840	0.940
Selenium (Se)	mg/kg d.s.	-	-	Not Available	Not Available	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	Not Available	Not Available	Not Available
Tin (Sn)	mg/kg d.s.	-	-	Not Available	Not Available	9,000	4,000	4,000	6,000	7,000	11,000	7,000	Not Available	Not Available	Not Available
Titanium (Ti)	mg/kg d.s.	-	-	Not Available	Not Available	203,000	979,000	970,000	746,000	518,000	217,000	5,700	Not Available	Not Available	Not Available
Vanadium (V)	mg/kg d.s.	-	-	Not Available	Not Available	70,000	98,000	97,000	59,000	51,000	65,000	84,000	Not Available	Not Available	Not Available
Zinc (Zn)	mg/kg d.s.	140,000	720,000	17,400	36,400	**164,000**	48,000	73,000	40,000	32,000	53,000	49,000	0.700	0.520	0.290
Available Zinc (Av. Zn)	mg/kg d.s.	-	-	0.250	0.550	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Iron (Av. Fe)	mg/kg d.s.	-	-	20,100	30,400	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Manganese (Av. Mn)	mg/kg d.s.	-	-	25,600	32,800	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Copper (Av. Cu)	mg/kg d.s.	-	-	0.940	0.370	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Lead (Av. Pb)	mg/kg d.s.	-	-	0.980	0.480	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Chromium (Av. Cr)	mg/kg d.s.	-	-	<0.020	<0.020	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Available Nickel	mg/kg	-	-	11,600	0.240	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not

Analytical Results of the Soil Samples

Parameter	***Units***	***Screening Values (according to the New Dutchlist)***	***Intervention Values (according to the New Dutchlist)***	***S1 - E***	***S3 - E***	***S6 - E***	***S7 - E***	***S8 - E***	***S9 - E***	***S10 - E***	***S11 - E***	***S12 - E***	***S2***	***S7***	***S11***
				KP 3.3	***KP 57.0***	***KP 99.8***	***KP 104.2***	***KP 135.9***	***KP 154.0***	***KP 180.0***	***KP 270.0***	***KP 357.4***	***~KP 395.0***	***KP 472.0***	***~KP 542.0***
				Soil Depth: 0 – 25 cm	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 30 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***	***Soil Depth: 0 – 25 cm***
(Av. Ni)	d.s.					Available	Available	Available	Available	Available	Available	Available	Available	Available	Available
Available Cadmium (Av. Cd)	mg/kg d.s.	-	-	0.036	0.028	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Total hydrocarbons	mg/Kg	-	-	Not Available	Not Available	182,900	5,600	5,300	7,900	3,800	6,500	7,300	Not Available	Not Available	Not Available
Aliphatic hydrocarbons	mg/Kg	-	-	Not Available	Not Available	182,700	5,600	5,300	7,900	3,800	6,400	7,200			
Total P.A.H.s	mg/Kg	1,000	40,000	Not Available	Not Available	0.190	0.020	0.020	0.060	0.020	0.003	0.080	Not Available	Not Available	Not Available
Total PCBs	mg/Kg	0.020	1.000	Not Available	Not Available	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	Not Available	Not Available	Not Available

S1 - E: The results of Soil Sample S1 – E (KP 3.3) show that the soil belongs to a clayey texture group, consisting of clay soil texture at all depths. The value of electrical conductivity is common, and the amounts of organic matter exist in satisfactory levels, for a typical Greek agricultural soil.

S3 - E: According to the results of S3 – E (KP 57.0), the soil belongs to a loamy texture group, consisting of loam soil texture at all depths. It is very strongly acid at the depth of 0 – 25 cm. The electrical conductivity is low. The amounts of organic matter exist in medium levels at the upper soil horizons. The exchangeable cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}) exist in low concentrations.

S6 - E: This particulate soil sample S6 - E (KP 99.8) was collected at a region that was downstream of the wastewater treatment plant and some of the existing animal slaughter houses of Komotini. Agricultural activities are not intensive and the soil consists of sand and silt/clay, rich in organic materials and characterized by well drainage and moderate structure. No reaction of soil's carbonated salts with HCl was detected (acid soil) and its colour is olive brown with code hue 2.5Y 4/3. The soil type is characterized as of alluvial deposits mixed with Regosols.

S7 - E: At this region of soil sample S7 - E (KP 104.2)agricultural and livestock activities were observed. The soil consists mainly of sand and there are indications of organic materials. This soil sample has moderate drainage, moderate structure and it did not react to HCl. Its colour is olive brown with code hue 2.5Y 4/2. Aspropotamos river's soil sample belongs to the soil type of alluvial deposits mixed with Regosols.

S8 - E: This soil sample S8 - E (KP 135.9) is dominated by sand, high rates of organic matter with ferrum oxides and the presence of red-yellow intercalations. It is characterized by loose structure, moderate drainage and urban sewage pressures are recognised. No effervescence of soil's carbonated salts with HCl was detected (acid soil) and its colour is olive brown with code hue 2.5Y 4/3. The soil type according to FAO system is classified as of alluvial with acidic elements.

S9 - E: The soil sample S9 - E (KP 154.0) of the wider area of Nestos river was collected at a region with agricultural activities and villages. This soil sample is sandy and structureless and characterized by well drainage. No effervescence of soil's carbonated salts with HCl was detected (acid soil) and its colour is yellowish brown with code hue 2.5Y 5/3. The soil type of the broader area belongs to the class of calcareous Rendzinas.

S10 - E: At the wider region of the Kavala station there are mainly agricultural areas and the soil is prevailed by sand and silt/clay and characterized by well drainage and low structure. No strong reaction of soil's carbonated salts to HCl was observed and its colour is brown with code HUE 7.5 YR 4/4. The soil sample S 10 - E (KP 180.0) collected from the station of Kavala belongs to the soil type of Mediterranean brown calcareous.

S11 - E: The soil in Serres station is characterized by a moderate drainage, moderate structure and the presence of sand and bits of clay. A slight reaction of soil's carbonated salts to HCl was observed and the colour is dark olive brown with code 2.5 Y. The soil sample S11 - E (KP 270.0) is classified as alluvial soil type with acidic elements.

S12 - E: At Nea Mesimvria (S12 – E, KP 357.4) the area is an agricultural lowland and was recently ploughed. The section is prevailed by sand and clay/silt, it is moderately drained and of moderate to strong structure. The soil class in the broader area, according to FAO classification system is alluvial deposits mixed with Regosols. No reaction of soil's carbonated salts to HCl was observed, indicating the presence of acid soils at this section. The soil's colour is described as brown with code Hue 7.5 4/3.

S2: Soil sample S2 (1.4 km south of KP 395.0) belongs to clayey texture group, and contains a very high percentage of organic matter which is unusual for a typical Greek agricultural soil.

S7: Soil sample S7 (KP 472.0) consists of sandy clay loam texture at the depth of 0-75 cm, and loam soil texture at the depth of 75-100 cm. The percentage of organic matter is very common for a typical Greek agricultural soil. The soil is slightly alkaline.

S11: Soil sample S11 (400 m east of KP 542.0) belongs to loamy texture group at the depth of 0-25 cm, consisting of silty clay loam soil texture. The percentage of organic matter is very common for a typical Greek agricultural soil. The soil is slightly alkaline.

Conclusions

The comparison of the different concentrations found in the samples with Dutch Screening Values indicates that:

- 2 samples (S1 – E and S2 – E) have elevated Cadmium (Cd) concentrations.
- 4 samples (S6 – E, S7 – E, S8 – E and S 12– E) have elevated Cobalt (Co) concentrations.

- 2 samples (S1 – E and S8 – E) have elevated Nickel (Ni) concentrations.
- 1 sample (S8 – E) has elevated Chromium (Cr) concentration
- 1 sample (S6 – E) has elevated Mercury (Hg) concentration
- 1 sample (S6 – E) has elevated Copper (Cu) concentration
- 1 sample (S6 – E) has elevated Zinc (Zn) concentration

The Cd, Co, Ni, Cr, Hg, Cu and Zn present in higher concentrations than the screening values, in the upper horizon, seem to be a result of human activity as a result of former wastes from agricultural and livestock activities, agrochemicals, urban / industrial wastes, mining activities and geological formations.

6.2.3.5 Key Characteristics

Table 6-9 summarises the key findings from the soil survey along the proposed TAP route. Land use and land cover details are presented in *Annex 6.6.3*.

Table 6-9 Soil Characteristics along the Pipeline Route

Section	*KP*	*Dominant Soil Type*	*Soil Quality*	*Soil Drainage*
River Evros area (KP 0.0 – 13.0)	0.0 – 0.4	CalcaricFluvisol	Very High	Poor
	0.4 – 4.5	Calcaro-vertic Cambisol	High	Poor
	4.5 – 13.0	Calcaro-vertic Cambisol	Medium to High	Well drained
Southern Evros (KP 13.0 – 62.0)	15.0 – 40.2	Calcaro-vertic Cambisol	Medium to High	Well drained
	40.2 – 43.2	Calcaro-vertic Cambisol	High	Well drained
	43.2 – 45.3	Calcaro-vertic Cambisol	Medium	Well drained
	45.3 – 58.7	Eutric Cambisol	Medium to Low	Well drained
	58.7 – 62.0	Eutric Cambisol	Low	Well drained
Lowlands of western part (KP 62.0 – 86.0)	62.0 – 62.3	Eutric Cambisol	Low	Well drained
	62.3 – 75.3	Calcaro-vertic Cambisol	High	Moderately well
	75.3 – 81.6	CalcaricFluvisol	Very high	Moderately well
	81.6 – 86.0	Calcaro-vertic Cambisol	Medium to high	Moderately well
Komotini – Xanthi Plain (KP 86.0 – 176.0)	86.0 – 93.2	Chromic Luvisol	High	Well drainen
	93.2 – 104.3	Calcaric Fluvisol	High	Well drained
	104.3 – 131.8	Eutric Cambisol	High	Moderately well
	131.8 – 133.5	Dystric Leptosol	High	Moderately well
	133.5 – 140.7	Chromic Luvisol	Medium	Moderately well

Section	*KP*	*Dominant Soil Type*	*Soil Quality*	*Soil Drainage*
	140.7 – 142.3	Calcaric Fluvisol	Medium	Moderately well
	142.3 – 144.3	Chromic Luvisol	Medium	Moderately well
	144.3 – 146.4	Calcaric Fluvisol	Low	Moderately well
	146.4 – 153.0	Chromic Luvisol	Low	Moderately well
	153.0 – 156.0	Rocks Outcrops	Low	Moderately well
	156.0 – 157.5	Chromic Luvisol	High	Well drained
	157.5 – 160.2	Calcaric Cambisol	High	Well drained
	160.2 – 176.0	Rocks Outcrops	High	Well drained
Kavala Mountains (KP 176.0 – 193.0)	176.0 – 179.3	Rocks Outcrops	High	Well drained
	179.3 – 180.3	Calcaric Fluvisol	Medium	Well drained
	180.3 – 193.0	Rocks Outcrops	Medium	Well drained
Philippoi Plain (KP 193.0 – 225.0)	193.0 – 201.7	Rocks Outcrops	Medium	Moderately well
	201.7 – 203.7	Rhodric Luvisol	Medium	Moderately well
	203.7 – 205.9	Calcaric Fluvisol	Medium	Moderately well
	205.9 – 206.3	Rhodric Luvisol	Medium	Moderately well
	206.3 – 225.0	Calcaric Fluvisol	Medium	Moderately well
Serres Plain (KP 225.0 – 295.0)	225.0 – 226.2	Calcaric Fluvisol	Medium	Moderately well
	226.2 – 230.1	Calcaro – Vertic Cambisol	Medium	Moderately well
	230.1 – 264.7	Calcaric Cambisol	High	Moderately well
	264.7 – 295.0	Calcaric Fluvisol	Medium	Well drained
Kroussia Mountains (KP 295.0 – 329.0)	295.0 – 295.4	Calcaric Fluvisol	Medium	Moderately well
	295.4 – 297.1	Calcaric Regosol	Medium	Moderately well
	297.1 – 315.9	Chromic Luvisol	Medium	Moderately well
	315.9 – 329.0	Dystric Regosol	Medium	Moderately well
Gallikos Plain (KP 329.0 – 359)	329.0 – 331.0	Dystric Regosol	Medium	Moderately well
	331.0 – 337.5	Rhodric Luvisol	Medium	Moderately well
	337.5 – 339.7	Dystric Regosol	Medium	Moderately well
	339.7 – 341.7	Rhodric Luvisol	Medium	Well drained
	341.7 – 341.9	Dystric Regosol	Medium	Well drained
	341.9 – 342.2	Rhodric Luvisol	Medium	Well drainede
	342.2 – 350.6	Dystric Regosol	Medium	Moderately well
	350.6 – 359	Vertic – Calcic Luvisol	Medium	Moderately well
Axios Plain (KP 359 – 425.4)	359.0 – 386.0	Calcaric Fluvisol	Very high	Well, moderate
	386.0 – 403.4	Calcaric Fluvisol	Very high	Poor
	403.4 – 418.2	Calcaric Fluvisol	Very high	Moderate to poor
	418.2 – 425.0	Calcaric Cambisol	Medium	Well drained
Vermio Mountain Slopes (KP 425.4 – 466.0)	425.0 – 427.2	Calcaric Cambisol	Medium	Well drained
	427.2 – 441.1	Calcaric Leptosol	Very Low	Well drained
	441.1 – 448.4	Rocks Outcrops	Low	N/A
	448.4 – 451.3	Calcaric Leptosol	Low	Well drained
	451.3 – 455.1	Rocks Outcorps	Low	N/A
	455.1 – 463.3	Calcaric Fluvisol	Very high	Well drained
	463.3 – 466.0	Vertic Calcic Luvisol	Medium	Moderately well

Section	*KP*	*Dominant Soil Type*	*Soil Quality*	*Soil Drainage*
Ptolemais Basin (KP 466.0 – 486.1)	466.0 – 486.0	Vertic Calcic Luvisol	Medium	Moderately well
Askion Mountain slopes (KP 486.1 – 506.9)	486.0 – 487.8	Vertic Calcic Luvisol	Medium	Moderately well
	487.8 – 496.4	Dystric Leptosol	Low	Well drained
	496.4 – 507.0	Calcaric Fluvisol	High	Well drained
Kastoria to border (KP 506.9 – 543.2)	507.0 – 511.5	Calcaric Fluvisol	High	Well drained
	511.5 – 540.7	Chromic Vertisol	High	Moderately well
	540.7 – 543.2	Calcaric Fluvisol	High	Well drained

Notes:
Soil Quality:
Very high: Good natural fertility
High: Generally fertile soils
Medium: Fertility depending on various parameters (ie. saturation, acidity)
Low: Very shallow soils and / or stony, subject to erosion

Collated by HCMR (2012); Exergia (2012) and ERM (2011)

Table 6-10 summarises the sensibility of soils regarding erosion and compactability (further analysis is provided in *Annex 6.6.3*).

Table 6-10 Soil Sensitivity in relation to Erodability and Compactability

Section	*KP*	*Dominant Soil Type*	*Erosion*	*Compaction*
River Evros area (KP 0.0 – 13.0)	0.0 – 0.4	CalcaricFluvisol	Low	High
	0.4 – 4.5	Calcaro-vertic Cambisol	Low	High
	4.5 – 13.0	Calcaro-vertic Cambisol	Low to moderate	Moderate
Southern Evros (KP 13.0 – 62.0)	13.0 – 40.2	Calcaro-vertic Cambisol	Low to moderate	Moderate
	40.2 – 43.2	Calcaro-vertic Cambisol	Low	High
	43.2 – 45.3	Calcaro-vertic Cambisol	Moderate	Moderate
	45.3 – 58.7	Eutric Cambisol	High	Low
	58.7 – 62.0	Eutric Cambisol	High	Low
Lowlands of western part (KP 62.0 – 86.0)	62.0 – 62.3	Eutric Cambisol	High	Low
	62.3 – 75.3	Calcaro-vertic Cambisol	Low	High
	75.3 – 81.6	CalcaricFluvisol	Low	High
	81.6 – 86.0	Calcaro-vertic Cambisol	Low	High
Komotini – Xanthi Plain (KP 86.0 – 176.0)	86.0 – 93.2	Chromic Luvisol	Moderate	Moderate
	93.2 – 104.3	Calcaric Fluvisol	Moderate	Moderate
	104.3 – 131.8	Eutric Cambisol	Moderate	Moderate
	131.8 – 133.5	Dystric Leptosol	Moderate	Moderate
	133.5 – 140.7	Chromic Luvisol	Moderate	Moderate
	140.7 – 142.3	Calcaric Fluvisol	Moderate	Moderate
	142.3 – 144.3	Chromic Luvisol	Moderate	Moderate
	144.3 – 146.4	Calcaric Fluvisol	High	Low
	146.4 – 153.0	Chromic Luvisol	High	Low

Section	*KP*	*Dominant Soil Type*	*Erosion*	*Compaction*
	153.0 – 156.0	Rocks Outcrops	High	Low
	156.0 – 157.5	Chromic Luvisol	High	Low
	157.5 – 160.2	Calcaric Cambisol	High	Low
	160.2 – 176.0	Rocks Outcrops	High	Low
Kavala Mountains (KP 176.0 – 193.0)	176.0 – 179.3	Rocks Outcrops	Moderate	Moderate
	179.3 – 180.3	Calcaric Fluvisol	Moderate	Moderate
	180.3 – 193.0	Rocks Outcrops	Low	High
Philippoi Plain (KP 193.0 – 225.0)	193.0 – 201.7	Rocks Outcrops	Moderate	High
	201.7 – 203.7	Rhodric Luvisol	Moderate	High
	203.7 – 205.9	Calcaric Fluvisol	Moderate	High
	205.9 – 206.3	Rhodric Luvisol	Moderate	High
	206.3 – 225.0	Calcaric Fluvisol	Moderate	High
Serres Plain (KP 225.0 – 295.0)	225.0 – 226.2	Calcaric Fluvisol	High	Low
	226.2 – 230.1	Calcaro – Vertic Cambisol	High	Low
	230.1 – 264.7	Calcaric Cambisol	Moderate	Moderate
	264.7 – 295.0	Calcaric Fluvisol	Moderate	Moderate
Kroussia Mountains (KP 295.0 – 329.0)	295.0 – 295.4	Calcaric Fluvisol	Low	High
	295.4 – 297.1	Calcaric Regosol	Low	High
	297.1 – 315.9	Chromic Luvisol	Low	High
	315.9 – 329.0	Dystric Regosol	Low	High
Gallikos Plain (KP 329.0 – 359)	329.0 – 331.0	Dystric Regosol	High	Low
	331.0 – 337.5	Rhodric Luvisol	High	Low
	337.5 – 339.7	Dystric Regosol	High	Low
	339.7 – 341.7	Rhodric Luvisol	High	Low
	341.7 – 341.9	Dystric Regosol	Moderate	Moderate
	341.9 – 342.2	Rhodric Luvisol	Moderate	Moderate
	342.2 – 350.6	Dystric Regosol	Moderate	Moderate
	350.6 – 359	Vertic – Calcic Luvisol	Moderate	Moderate
Axios Plain (KP 359 – 425.4)	359.0 – 386.0	Calcaric Fluvisol	Low	High
	386.0 – 403.4	Calcaric Fluvisol	Low	High
	403.6 – 418.2	Calcaric Fluvisol	Low	High
	418.2 – 425.0	Calcaric Cambisol	Moderate	Moderate
Vermio Mountain Slopes (KP 425.4 – 466)	425.0 – 427.2	Calcaric Cambisol	Moderate	Moderate
	427.2 – 441.1	Calcaric Leptosol	High	Low
	441.1 – 448.4	Rocks Outcrops	High	Low
	448.4 – 451.3	Calcaric Leptosol	Moderate	Low
	451.3 – 455,1	Rocks Outcorps	High	Low
	455.1 – 463.3	Calcaric Fluvisol	Low	High
	463.3 – 466.0	Vertic Calcic Luvisol	Moderate	High
Ptolemais Basin (KP 466. – 486.1)	466.0 – 486.0	Vertic Calcic Luvisol	Moderate	High
Askion Mountain slopes (KP 486.1 – 506.9)	486.0 – 487.8	Vertic Calcic Luvisol	Moderate	High
	487.8 – 496.4	Dystric Leptosol	High	Low

Section	*KP*	*Dominant Soil Type*	*Erosion*	*Compaction*
	496.4 – 507.0	Calcaric Fluvisol	Low	Moderate
Kastoria to border (KP 506.9 – 543.2)	507.0 – 511.5	Calcaric Fluvisol	Low	Moderate
	511.5 – 540.7	Chromic Vertisol	Moderate	High
	540.7 – 543.2	Calcaric Fluvisol	Low	Moderate

Collated by HCMR (2012); Exergia (2012) and ERM (2011)

Conclusions

According to the *Table 6-9* **Soil Characteristics along the Pipeline Route** the soil quality is mixture through the pipeline route and it is characterized low to very high. For most of the pipeline length the soil quality is medium (207.8 km). Also, the soil drainage is characterized poor to well, along the pipeline route. For the most of the pipeline length the soil drainage is characterized moderately well (262.5 km).

According to the *Table 6-10* along most of the route, soils have fairly good cohesion where soil structure provides for aggregate stability and reduces the likelihood of soil erosion. However, there are vulnerable sections (total appr. 133 km) where the soils erosion risk is particular high due to the soil properties and topography. Along the pipeline corridor there are vulnerable sections (total appr. 220 km) where the soils compaction risk is particular high due to the soil properties and topography. Also, the sections that exhibit moderate (total about 209 km) sensitivity for compaction.

6.2.4 Groundwater

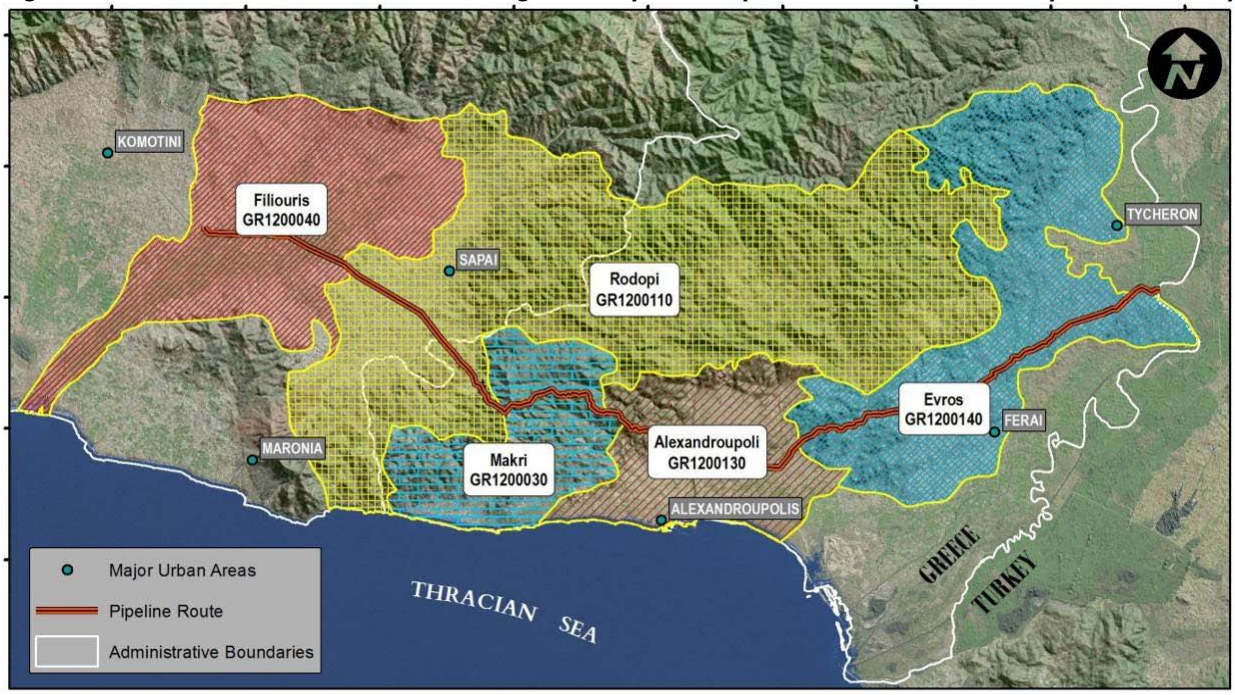
6.2.4.1 Regional Overview

Groundwater in Greece is present in different types of rocks of different ages. It is mainly used for the irrigation purposes and in some areas as a source of drinking water. Groundwater is exploited through boreholes located mainly in the plans and valleys. The TAP route is laid mainly on recent sediments of Neoqene / Quaternary age with the exception of the metamorphic and igneous formations of Rhodopi and of the Vermio and the Askio passes. Groundwater occurs under most of the pipeline route, in different depth and conditions.

In order to comply with the Water Frame Directive (WFD, 2000/60//EC) acquifers were grouped into groundwater bodies. This classification was undertaken by the Institute of Geology and

Mineral Exploration (IGME) and adopted by the Ministry of Environment, Energy and Climate Change in 2011. The groundwater body (GWB) is the management unit under the WFD that is necessary for the subdivision of large geographical areas of aquifer in order for them to be effectively managed. Groundwater body within the WFD is defined as “a distinct volume of groundwater within an aquifer or aquifers”. The groundwater bodies have been assigned a unique code which is related to the water district and the body’s serial number within the district. The pipeline route is laid over 23 distinct aquifers (groundwater bodies) which are presented in the following paragraphs. *Figure 6-8* to *Figure 6-10* present maps of the groundwater bodies across the proposed of TAP route.

Figure 6-8 Groundwater Bodies along the Proposed Pipeline Route (Section Kipoi - Komotini)



Source IGME (2010). Image produced by EXERGIA (2012)

Figure 6-9 Groundwater Bodies along the Proposed Pipeline Route (Section Komotini - Thessaloniki)

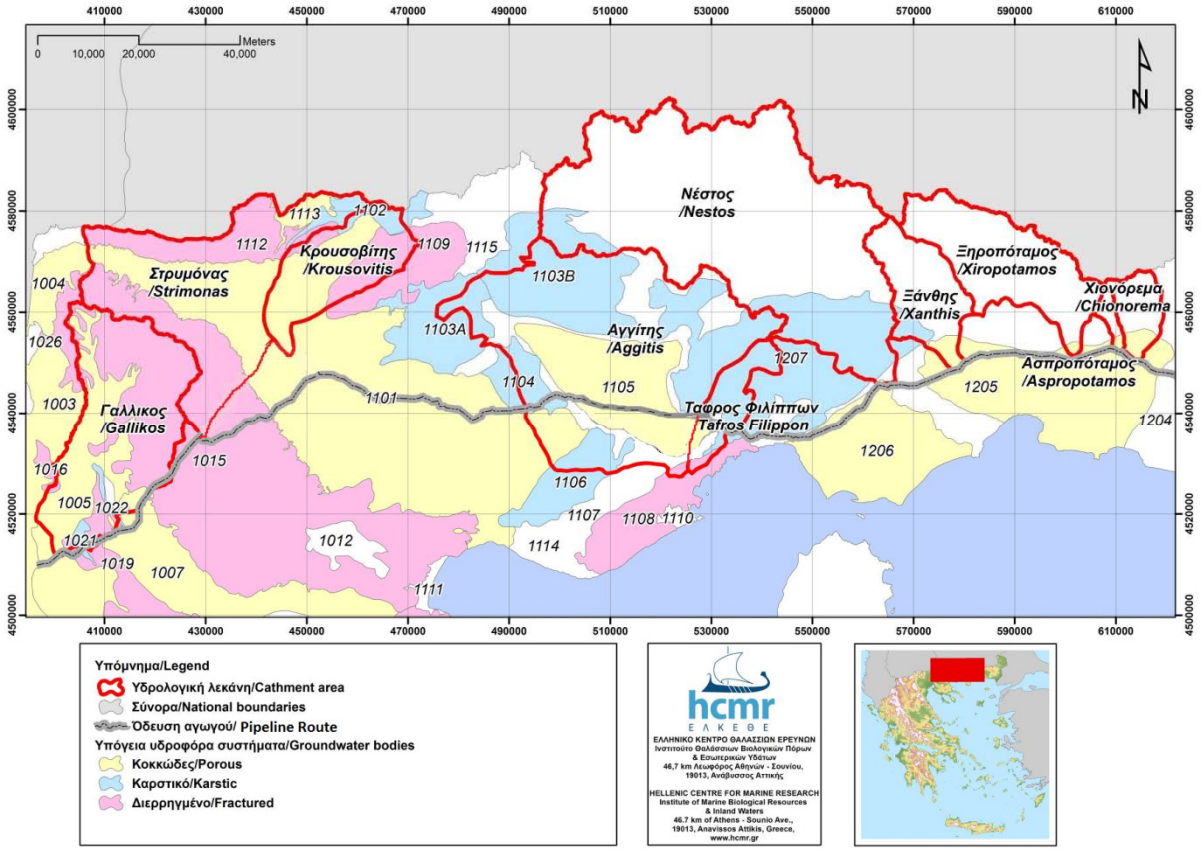
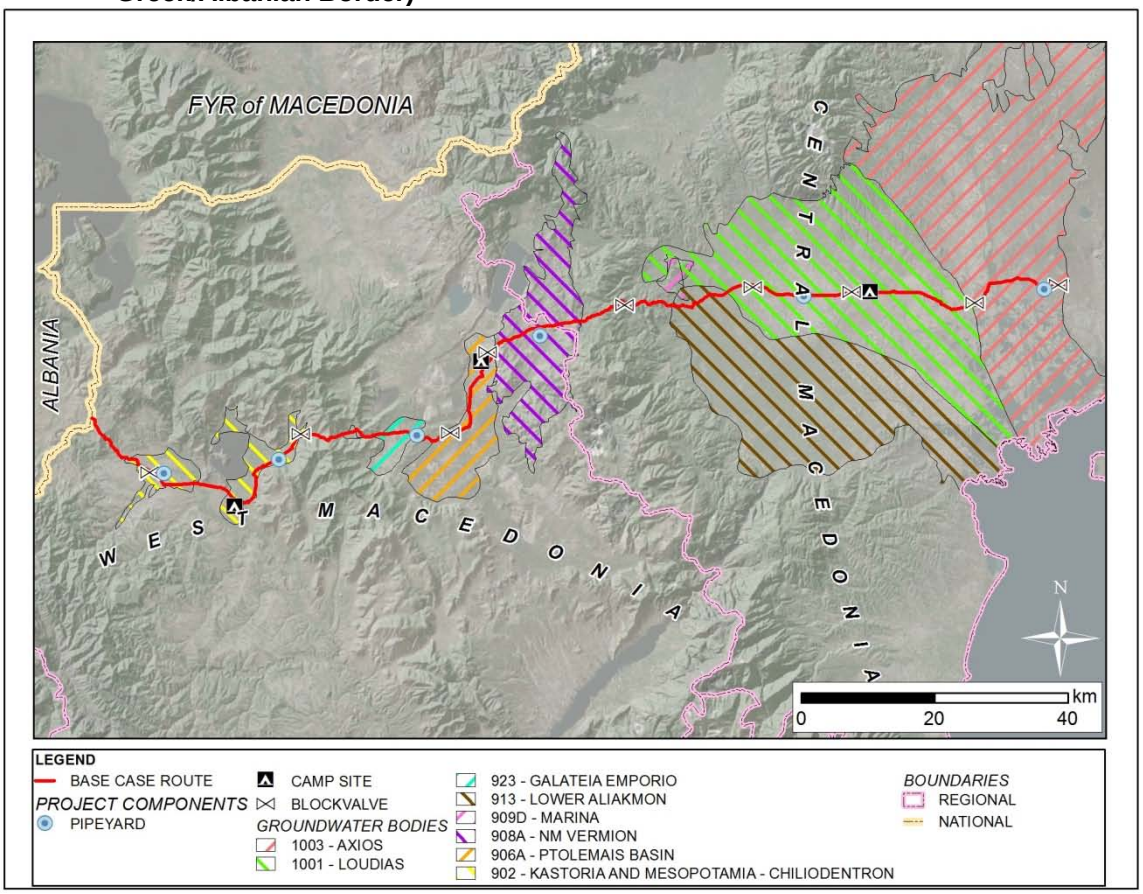

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Κρουσοβίτης /Krousovitis
Γαλλικος /Gallikos
Αγγίτης /Aggitis
Ταφρος Φιλίππων /Tafros Filippon
Ξηροπόταμος /Xiropotamos
Ξάνθης /Xanthis
Χιονόρεμα /Chionorema
Ασπροπόταμος /Aspropotamos
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Figure 6-10 Groundwater Bodies along the Proposed Pipeline Route (Section Thessaloniki – Greek/Albanian Border)



Data source IGME (2010). Image produced by ERM (2011)

6.2.4.2 Aquifer Description

This section describes the main characteristics of the aquifers across the different sections crossed by the proposed pipeline route. A full description of the groundwater bodies' properties, in terms of lithology, hydraulics and quality is available at extensive reports in *Annex 6.6.2.*

Table 6-11 presents the characteristics and extent of the groundwater bodies along the study area.

Table 6-11 Characteristics and Extent of Groundwater

Code number of Groundwater bodies	*Name of Groundwater Bodies*	*Section*	*Type*	*KP from*	*KP to*
GR1200140	Evros	River Evros area, Southern Evros	Fractured	0	32
GR1200130	Alexandroupoli	Southern Evros	Mixed	32	49
GR1200030	Makri	Southern Evros	Kartsic	49	59
GR1200110	Rodopi	Lowlands of western part	Fractured	59	75.5
GR1200040 1204 *	Filiouris	Lowlands of Evros	Porous	75.5	87
1205	Xanthi - Komotini	Komotini-Xanthi Plain	Porous	94	146
1206	Nestos Delta	Komotini-Xanthi Plain	Porous	146	178
1207	Lekani	Kavala Mountains	Karstic	178	194
1105	Drama	Philippoi Plain	Porous	194	227
1104	Aggitis	Serres Plain	Karstic	227	239
1101	Serres	Serres Plain	Porous	239	296
1015	Krousia -Kerdyllia	Kroussia Mountains	Fractured	296	328
1007	Mygdonia	Gallikos Plain	Porous	328	343
1019	Cholomonta-Oraiokastro	Gallikos Plain	Fractured	343	346
1021	Mesaio	Gallikos Plain	Karstic	346	349
1005	Gallikos	Gallikos Plain	Porous	349	359
1003	Axios	Axios Plain	Porous	359	376.2
1001	Loudias	Axios Plain	Porous	376.2	415
0913	Lower Aliakmon	Axios Plain	Porous	415	424.8
0908a	NW Vermion	Vermio Mountain slopes	Karstic	440.9	455.8
0906a	Ptolemais Basin	Ptolemaida Basin	Porous	455.8	474.7
0923	Galateia Emporio	Ptolemaida Basin and Askion Mountain Slopes	Porous	478.2 488.4	484 490.5
0902a/b	Kastoria and Mesopotamia - Chiliodentron	Kastoria to border	Porous	496.9 513.4 522.1	512 516.3 534.1

**Note: The code numbers GR1200040 and 1204 describe the same groundwater body.*
Collated by ERM (2011), ASPROFOS (2013), HCMR (2012) and EXERGIA (2012)

6.2.4.2.1 River Evros Area Section

Fractured groundwater body of Evros (GR1200140) – KP 0 - 32

It is formed by local aquifers due to intense faulting and jointing that are hosted within a complex volcano-sedimentary formation of Oligocene-Miocene age. Locally, unconfined aquifers can be found in the recent alluvial and terrace deposits of streams and in the EvrosRiver floodplain to the east. Bedrock formations show a great variety of marls, sandstones, conglomerates, shales along with cohesive pyroclastic deposits and andesites/dacites. Although locally there can be found significant alluvial and river terrace deposits, most boreholes and wells supply water from the deeper (mainly confined) aquifers within the bedrock formations at varying depths. Aquifers are formed in fractured bedrocks zones and intercalations of porous (sandstones, conglomerates) formations. Presence of shallow groundwater is rare, apart from the local floodplains in streams and torrents. An extensive unconfined aquifer can be found in the Evros River floodplain. In this floodplain, groundwater level is found at 0.5 – 1.0 mbgl due to the direct hydraulic contact with Evros River and the presence of an extensive irrigation system. The compressor Station GCS00 will be installed in this Section K.P 3.6. According to local informations the aquifer level is found at 2 m. For this reason groundwater abstraction is possible

6.2.4.2.2 Southern Evros Section

Mixed (Porous/fractured) groundwater body of Alexandroupoli (GR1200130) – KP 32 - 49

Consists of the water basins of Avas- Loutros and the coastal plain of Alexandroupoli. Hydrogeologic conditions vary between porous aquifers in the recent loose sediments of the river valleys and Alexandroupoli plain, and karstic aquifers in the Eocene marls, sandstones and limestones of the bounding hills. Groundwater flow is generally towards south to the coastal plain, following the gently dipping surface elevation. Near Agnantia, water supply is achieved only by an unconfined aquifer of 4-15 mbgl, while in the area around Amfitriti a confined artesian aquifer can be reached at depths of 75-100 mbgl. A high-yield geothermal field is situated south of Agnantia.

Karstic groundwater body of Makri (GR1200030) – KP 49 - 59

It is located in the area between Komotini- Sapai plain and Alexandroupoli municipal area. It is formed by metamorphic rocks with intercalations of carbonate rocks (marbles and crystalline dolomites). Aquifers can be found locally due to fracturing and the presence of carbonate lenses

and beds. Presence of metamorphic rocks prohibits the formation of a complete karstic underground system. The suggested pipeline crosses the groundwater body in the northern part, where groundwater flows towards the lower coastal area of Makri in the south. No further data have become available regarding the depth to groundwater around the suggested pipeline route, although the topography and local geologic conditions along the route prohibit the presence of shallow groundwater.

6.2.4.2.3 Lowlands of Evros Section

Fractured Bedrock Groundwater body of Rodopi (GR1200110) – KP 59 – 75.5

It is formed by local aquifers due to intense faulting and jointing that are hosted within a complex volcanic formation of Oligocene age. The deposits consist of sandstones, marls, tuffs, brecia, conglomerates, pyroclastic depostis, lahars and rhyodacites. Shallow groundwater in this area occurs from 0.5 mbgl and 3 mbgl, while the presence of a deeper (40 mbgl) confined aquifer is also documented in the western part. The groundwater flow at the suggested pipeline route generally point towards the plain of Komotini and Filiouris groundwater body. Deep boreholes and water wells are rare in the area and supply water from local aquifers in fractured zones. A geothermal field is situated near Sapai town with a yield of 40^0C in a depth of 300 m.

Porous Groundwater body of the River Filiouris (GR1200040) – KP 75.5 - 87

The main aquifer is hosted within the Quaternary and Tertiary deposits which are in direct hydraulic contact with the surface waters of the River Filiouris and adjacent streams. Deposits show a varying permeability and in the area studied they form an unconfined aquifer in a depth of 4-8 mbgl. The groundwater body has an area of 335 km^2 and is related to the protected area of FiliourisRiver. The shallow aquifer has a seasonal variation of groundwater level of 3.0 – 4.0 m. Unconfined aqufiers in the plains around Filiouris River show a depth of 3 – 8 mbgl as indicated by numerous water wells and shallow boreholes, especially in the western part. Flow of groundwater is generally towards S – SE and locally towards the FiliourisRiver. Groundwater level at the southern/coastal part is in general negative (below sea level) absolute height

6.2.4.2.4 Komotini – Xanthi Plain Section

Porous Groundwater Body of Xanthi – Komotini (1205) – KP 94 - 146

The capacity of aquifer depends on the presence and the distribution of the coarse grained material, which is located mainly near large (Kompsatos, Kosynthos) or smaller (Aspropotamos, Bosbos) streams. The average depth of the Xanthi – Komotini porous groundwater body is 45 m and the area 250 $km^{2.}$ The groundwater level fluctuation has a range of 4 m and average depth 8 m (19 m altitude). Permeability of aquifer is 6.7 $*10^{-5}$ m/sec. Live storage capacity is estimated to be 90 * 10^6 m^3/year.

General the geological formations of the study area, depending on their hydrogeological behaviour, can be divided into permeable formations, semi – permeable, impermeable and of varying permeability.

Specifically the hydrogeological formulation of Bosbos river basin consisting of sedimentary formations with high permeability in percentage 33%, metamorphic formations with moderate capacity in percentage 15%, impervious formations in percentage 51.6% and formations with irregular changes in permeability in percentage 0.3%.

The hydrogeologicalformulation of Aspropotamos river' basin, consisting of sedimentary formations with high permeability in percentage 68.7% semi-permeable metamorphic fragmented formations in percentage 11.9% and impervious formations in percentage 19.5%.

The hydrological formulation of Xiropotamos stream's basin, consisting of sedimentary semipermeable formations in percentage 15.7%, marbles with high capacity in percentage 12.2%, semipermeable, igneous, fragmented formations in percentage 17.1% and impervious formations in percentage 55%.

The hydrogeological formulations of Xanthi river's basin consisting of sedimentary formations with high permeability in percentage 7.1%, sedimentary formations with moderate capacity in percentage 3.1%, alluvial fans (porous formulations) in percentage 0.6%, amphibolites with high capacity in percentage 0.8%, rhyolites and marbles (semipermeable formations) in percentage 25.4% and impervious igneous and metamorphic formations in percentage 62.9%

Nestos Delta Porous Groundwater Body (1206) – KP 146 - 178

It is located at the Quaternary deposits of Nestos river. The average depth of the Nestos Delta porous groundwater body is 20 m and the area 250 km^2. The groundwater level fluctuation has a range of 3 m and average depth 38 m (4 m altitude). Permeability of the aquifer is 4.2 * 10^{-4} m/sec. Live storage capacity is estimated to be 2 * 10^6 m^3/year.

The hydrogeological formulation of Nesto's river's basin, consisting of sedimentary formulations with high permeability in percentage 5.8%, semipermeable formations in percentage 45.9%, marbles (semipermeable, fragmented formations) in percentage 20.3% and impervious formations in percentage 28%.

6.2.4.2.5 Kavala Mountains Section

Lekani karstic groundwater body (1207) - KP 178 - 194

This specific groundwater body is located among Xanthi, Drama and Kavala, at the carbonate formations (karstic marbles) of Lekani mountains. It is recharged by precipitation and Nestos river. The average depth of the Lekani karstic groundwater body is 100 m and the area 1,209 km^2. The groundwater level fluctuation has a range of 22 m and average depth 150 m (90 m altitude). Permeability of the aquifer is 0.001 m/sec. Live storage capacity is estimated to be 500 * 10^6 m^3/year.

6.2.4.2.6 Philippoi Plain Section

Drama porous groundwater body (1105) – KP 194 - 227

This specific groundwater body consists of lacustrine (Pliocene) and terrestrial (Pleistocene) deposits of Drama basin. Due to lack of vertical and horizontal homogeneity, unconfined and confined aquifers are formed. The average depth of the Drama porous groundwater body is 40 m and the area 504 km^2. The groundwater level fluctuation has a range of 5 m and average depth 2.5 m (82 m altitude). Permeability of the aquifer is 9*10^{-5} m/sec. Live storage capacity is estimated to be 75 * 10^6 m^3/year.

6.2.4.2.7 Serres Plain Section

Aggitis Karstic Groundwater Body (1104) KP 227 - 239

It is located at the southern part of Menoikio mountain that is structured by fractured and karstic marbles. The presence of schistic and gneissic unpermeable layers is responsible for the creation of aquifers. The discharge of the Aggitis karstic groundwater body is accomplished by Galazia Nera, Symvoli and Karnatsa springs. The area of Aggitis groundwater body is 130.2 km^2. Permeability of the aquifer is 10^{-2} - 10^{-5} m/sec. Live storage capacity is estimated to be 45 * 10^6 m^3/year.

The hydro-geological formulation of Aggitis river's basin, consisting of sedimentary formations with high permeability (alluvial deposits) in percentage 21.0%, semipermeable formations in percentage 28.8%, marbles (semipermeable fragmented formations) in percentage 36.5% and impervious metamorphic formations in percentage 13.7%

Serres porous groundwater body (1101) – KP 239 – 296

It is located at the lowland and hilly part of Serres basin, at the quaternary and tertiary formations. The permeability depends on the presence of clay and is low at tertiary formations. The recharge of Serres groundwater body is accomplished by precipitation and by underground flows from Agkistro, Menoikio and Paggaio mountains. The average depth of the Serres groundwater body is 65 m and the area 2,279 km^2. The groundwater level fluctuation has a range of 0.3 - 5.5 m and average depth 12 m (34 m altitude). The permeability of the aquifer ranges between 10^{-3} and 10^{-6} m/sec. Live storage capacity is estimated to be 330 * 10^6 m^3/year. The Compressor Station GCS01 will be installed in this Section. The aquifer level has an average depth of 12 m. For this reason groundwater abstraction is possible.

6.2.4.2.8 Kroussia Mountains Section

Krousia - Kerdyllia fractured groundwater body (1015) – KP 296 - 328

This groundwater body is located at Krousia, Vertiskos and Kerdyllia mountains. The discharge of this system is accomplished through many small springs at various altitudes, which indicates the lack of a uniform and thorough drainage. The area of the Krousia - Kerdyllia groundwater is

2,179.6 km^2. The groundwater level fluctuation has a range of 0.2 - 38.8 m. Permeability of the aquifer 6.6 * 10^{-7} - 1.5 * 10^{-5} m/sec.

6.2.4.2.9 Gallikos Plain Section

Mygdonia porous groundwater body (1007) – KP 328 - 343

It is located at the eastern part of ThessalonikiPrefecture, inside the quaternary and Neocene deposits of the area.The average thickness of the Mygdonia groundwater body is 30 - 450 m and the area 687 km^2. The groundwater level fluctuation has a range of 0.1 - 15 m and average depth 8 m (87 m altitude). The permeability of the aquifer ranges between 2.5 * 10^{-6} and 2.2 * 10^{-3} m/sec. Llive storage capacity is estimated to be 98.2 * 10^6 m^3/year.

Cholomonta - Oraiokastro fractured groundwater body (1019) – KP 343 - 346

It is located at the central part of Chalkidiki and ThessalonikiPrefectures. The aquifer is formed at the surface between weathered and unweathered rocks (schist, gneiss, amphibolite) and inside fractured formations. The average thickness of the Cholomonta - Oraiokastro groundwater body is 10 - 400 m and the area 1,944 km^2. The groundwater level fluctuation has a range of 0.2 - 15 m and average depth 40 m (354 m altitude). Permeability of the aquifer is 10^{-8} - 10^{-5} m/sec. Live storage capacity is estimated to be 99 * 10^6 m^3/year.

Mesaio karstic groundwater body (1021) – KP 346 - 349

It is located at the wider area around Mesaio, at the southestern part of Gallikos river catchment. These carbonate formations have small thickness but are profoundly karstified and therefor aquifers of limited capacity are formed. The area of Mesaio groundwater body is 16.4 km^2. The groundwater level fluctuation has a range of 2.3 m and depth 112.5 - 115.9 m (69 m altitude).

Gallikos porous groundwater body (1005) – KP 349 - 359

It is located at the postalpine deposits at Gallikos river catchment. The main characteristic of this groundwater body is the various hydrogeological behaviours, depending on the lithology and thickness of the deposits that generally increases towards south. Due to alterations of permeable, semipermeable and unpermeable layers, unconfined, semiconfined or confined multilayered aquifers are formed. The average depth of the Gallikos groundwater body is 8 m at the northern part of the basin, 25 m at the southern part of the basin. The groundwater level fluctuation has a

range of 0.2 – 4.1 m and average depth 10 m (98 m altitude). Permeability of the aquifer is $3.7 * 10^{-3}$ m/sec. Live storage capacity is estimated to be $35 * 10^{6}$ m^3/year.

The hydro-geological formulation of Galliko's river's basin consists of formations with moderate capacity in percentage 2.8%, semi-permeable sedimentary porous formations in percentage 37.6%, semipermeable fragmented formations in percentage 2.7% and impervious formations in percentage 56.7%.

6.2.4.2.10 Axios Plain Section

Porous Groundwater body of Axios (1003) – KP 359 – 376.2

This body encompasses different aquifer settings in different areas. The shallowest aquifer has an average depth of groundwater of 3.2 mbgl, while the middle aquifer occurs at an average depth of 9.87 mbgl, and the deep aquifer occurs at a depth of 29 mbgl. These values were calculated from groundwater measurements in various boreholes from 2004 to 2008. The occurrence of shallow groundwater is not clearly stated, however, it is anticipated to be next to the surface water bodies in the area, mainly the River Axios. Three main groundwater flow directions have been defined within the groundwater body. Groundwater that flows from the west to east around the area of Polikastro (Kilkis) forms the first flow axis. The second one lies on a NE-SW direction towards the Arzan dried up lake. The third groundwater flow component lies on a NW-SE direction from the westerly hills area towards the River Axios. The proposed TAP route crosses the groundwater body in the south, where no significant groundwater divide occurs, forming a unified aquifer in the south of the dried up Giannitsa Lake. The groundwater contours are not dense and the resulting hydraulic gradient smooth.

Porous Groundwater Body of Loudias (1001) – KP 376.2 – 415

The average annual groundwater fluctuation level is 3.0 m. Groundwater is discharged towards the area of the dried up Giannitsa Lake. The groundwater flow lines point towards the centre of the area of the groundwater body towards the Giannitsa Lake area forming a radial shape from the groundwater body boundaries to the centre. The hydraulic gradient is variable; high in the north of the aquifer system around 7 ‰, getting lower values to the south between 0.8 ‰ and 0.5 ‰. The proposed TAP route crosses the middle part of the groundwater body at the area of the dried up Giannitsa Lake on a W – E direction. Groundwater is expected to be shallow in the

vicinity of the Giannitsa Lake; around KP 402, KP 404, KP 410 and KP 412 boreholes located within the 2 km buffer of the proposed TAP route showed depths of less than 5 m (although it must be noted that these boreholes are not located within immediate vicinity to the pipeline route). It is stated (Veranis, 2010) that shallow groundwater in this area occurs from 0.5 mbgl to 3 mbgl. Shallow groundwater is also expected to the west boundary of the groundwater body towards the areas of Skidra, but no further detailed specific data has become available.[11]

Porous groundwater body of Lower Aliakmon (0913) – KP 415 – 424.8

The average groundwater head is 13 masl. Groundwater flow lines follow the topographical terrain. They have a direction from NW to the SE in the north of the groundwater body (average hydraulic gradient around 20 - 25 ‰), and this becomes SSW to NNE in the southern parts of the groundwater body where the gradient is variable between 1 – 1.07%. The proposed TAP route crosses the groundwater body in the N-NW corner, very close to its boundary, where groundwater flows radially from the high groundwater area between the municipalities of Marina and Episkopi. Evidence from groundwater level data to the NW of the body indicates groundwater depths of greater than 5 mbgl. No further data has become available regarding groundwater depths along the proposed TAP route.

6.2.4.2.11 Vermio Mountain Slopes Section

Karstic groundwater body of NW Mountain Vermio (code 908a) – KP 440.9 – 455.8

This groundwater body is located between KP 440.9 and KP 455.8 of the pipeline route, in the western slopes of the Vermio Mountain. The groundwater body could be divided in four distinct groundwater units:

- NW Vermio groundwater unit;
- W – NW Vermio groundwater unit;
- North Vermio groundwater unit; and
- East Vermio groundwater unit.

[11] Quantitative data in this section is indicative.

The average groundwater head in the area is around 510 masl. The average depth to groundwater is 117 mbgl and the average annual groundwater fluctuation is 3 m.
The groundwater flow of this unit suggests that it discharges into the Vegoritida Lake.

The four distinct groundwater units as described in the previous paragraph are dominated by different flow regimes:

- The SW Vermio groundwater unit is discharged to the Neraida springs, in the vicinity of the River Aliakmo. Surface flow is minimal and groundwater head is around 250 masl;
- W – NW Vermio groundwater unit is discharged to the lake Vegoritida. This is the mostt significant groundwater unit of the groundwater body;
- North Vermio groundwater unit is discharged to the lake Nisi; and
- East Vermio groundwater unit is discharged to numerous springs.

6.2.4.2.12 Ptolemaida Basin

Porous Groundwater Body of Ptolemaida Basin (code 906a) – KP 455.8 – 474.7

This groundwater unit, located next to the previous one mentioned, covers most of the Ptolemaida Basin section from KP 455.8 to 474.7 as well as the westernest slopes of Vermio Mountain. section. The groundwater head is variable in the aquifer from around 540 to 640 masl. The average depth to groundwater is 19 mbgl and the average annual groundwater fluctuation is 3 m. According to the available time series data groundwater regionally flows radially towards the centre of the groundwater body, from the areas of Komnina in the west and Ptolemaida in the south towards the area of Perdikas to the west. Locally this general pattern is distorted due to the big open pit excavations for extracting lignite for electricity generation.

Porous groundwater body of Galateia – Emporio (code 923) – KP 478.2 – 484

This groundwater body, which is crossed by the pipeline between KP 478.2 and 484 is not very extensive and there is no much data available to identify groundwater flow directions. The regional groundwater flow is believed to be towards the Perdikas Dam Lake to the east. Groundwater level data from one borehole analyzed by IGME, indicate groundwater head is in the vicinity of 635 masl. The average depth to groundwater is 11.5 mbgl and the average annual groundwater fluctuation is 6 m.

6.2.4.2.13 Askion Mountain Pass

Porous Groundwater body of Askion Mountain Slopes (code 923) KP 488.4 – 490.5

The only groundwater unit crossed by the pipeline within this section corresponds to the groundwater body of Galateia-Emporio (see above) that comes from the Ptolemaida Basin section and is crossed between KP 488.4 to 490.5 close to Variko village.

6.2.4.2.14 Kastoria to Border Section

Porous Groundwater body of Kastoria – Border Section (code 0902) KP 496.9 – 534.1

This groundwater body is crossed by the pipeline route in two parts from KP 496.9 approximately (which partly falls in the Askion Mountain Pass section) to KP 516.3 and between KP 522.1 and 534.1. Shallow groundwater is expected in this groundwater body. The average depth to groundwater in the area is 6.5 mbgl and the average annual groundwater fluctuation is 2 m. However, groundwater is expected shallower in the areas close to the River Aliakmon and its tributaries. There are no further data regarding groundwater flow directions and groundwater heads. However, groundwater is expected to follow the topographical terrain and also to be affected by the River Aliakmonas.

6.2.4.3 Groundwater Vulnerability across the Project Area

This section provides a qualitative assessment of the groundwater vulnerability along the pipeline route. Groundwater vulnerability depends on a variety of parameters amongst which is depth of groundwater table, permeability of the aquifer material and permeability of aquifer overlying strata or soil horizon. There are no official groundwater vulnerability maps published for Greece, and therefore there is no official reference source to define vulnerability in the study area. In this context, the description of groundwater vulnerability is approached qualitatively.

No unique vulnerability classification can be assigned to each section of the pipeline route because different areas in the same aquifer might also have a different groundwater vulnerability classification. On outline of the potentially areas of high vulnerability based on existing references and best practice is presented in *Table 6-12* .

Table 6-12 Potential High Groundwater Vulnurable Areas along the pipeline route

Route section	*Chainage (KP)*	*Total length (km)*	*Potential for groundwater vulnerable areas*
River Evros	0 - 3.5	3.5	High - Vulnerability depends on soil cover
Southern Evros	12 - 15	12	High - Vulnerability depends on soil cover
	32 - 36		High - Vulnerability depends on soil cover
	39 - 44		High - Vulnerability depends on soil cover
Lowlands of Evros	77 - 87	10	High - Vulnerability depends on soil cover
Komotini-Xanthi Plain*	81.0 - 81.7	17.8	High - Vulnerability depends on soil cover
	98.0 - 99.5		
	103.0 - 105.0		
	112.0 - 113.7		
	116.0 - 120.0		
	135.1 - 136.5		
	140.0 - 146.5		
Philippoi Plain	210 - 225	15	High - Vulnerability depends on soil cover
Serres Plain	238 - 242	9.8	High - Vulnerability depends on soil cover
	264.0 - 265.0*		
	281.0 - 281.8*		
	290 - 294		
Gallikos Plain	356 - 360.5*	4.5	High - Vulnerability depends on soil cover
Axios Plain	371 - 394	26	Shallow groundwater expected - Vulnerability depends on soil cover
	397 - 400		
Vermio Mountain Slopes	427.1 - 471	43.9	Karst terrain - Deep groundwater - Vulnerability depends on soil cover
Askion Mountain slopes	484 - 490	17	Shallow groundwater expected - Vulnerability depends on soil cover
	490 - 491		Karst terrain – Deep groundwater – Vulnerability depends on soil cover
	497 - 507		Shallow groundwater expected - Vulnerability depends on soil cover
Kastoria to border	507 - 533	26	Shallow groundwater expected - Vulnerability depends on soil cover

* Data available from previous projects

Source: ERM (2011), ASPROFOS, HCMR and EXERGIA (2013)

6.2.4.4 Groundwater Sampling

The field survey created an inventory of the boreholes within a 500 m buffer along the pipeline rout – 250 m either side of the proposed pipeline route centreline (presented in *Annex 6.6.2*). All the recorded boreholes were assumed to be private abstractions mainly used for irrigation purposes. The boreholes were located in fields and some of them linked to irrigation network. Although it is not known if groundwater from these abstractions is used for other purposes, such as drinking water supply. Where is possible, groundwater chemical parameters (pH, electrical

conductivity (E_C), temperature (T_m), turbidity and Redox potential (E_h)) were measured directly in the field and a sample was collected in order to have an independent record of the groundwater quality prior to the pipeline construction.

For section Kipoi – Komotini and Thessaloniki – Albanian borders the samples were collected from the boreholes found to pump groundwater (so that a fresh sample is guaranteed). Samples were stored in bottles filled until no air bubbles were present. The bottles were sealed, labelled and placed inside a cooler with ice packs. Samples were delivered for analysis by hand to AGRO LAB in Thessaloniki. The groundwater sampling for Section Komotini – Thessaloniki was conducted in September 2012 from HCMR. A portable multiparameter field instrument was used to measure field parameters including: Temperature, pH, electrical conductivity, and turbidity. Groundwater samples were stored in special containers in which 1 ml of mercuric chloride (Hg_2Cl_2) per 500 ml of sample was added in order to be preserved. Subsequently, the water samples were transferred to HCMR laboratory for chemical analysis.

The criteria for the selection of the sampling points were groundwater availability (the boreholes had to pump during visit or be operational), good spacing among the selected points (not close together) and also different hydro-geological environments. During the site investigation at Section Kipoi – Komotini 50 groundwater abstractions were recorded and 5 samples were collected for analyses, while at the Section Komotini – Thessaloniki 10 groundwater abstractions were recorded and 9 groundwater samples were collected for analysis. For the section Thessaloniki – Albanian border during the site investigation 27 boreholes were recorded within a 500 m buffer from the proposed pipeline route and it was possible to collect groundwater samples from five of these for analysis. It was not possible to pump the remaining 22 boreholes during the site visit and therefore no samples were collected from these.

Groundwater sampling locations are presented in *Figure 6-11* for Section Kipoi – Komotini, in *Figure 6-12* for Section Komotini – Thessaloniki and in *Figure 6-13* for Section Thessaloniki – Albanian border (these locations are also presented in the more detailed *Annex 4.3* maps). The sampling points are referred also in *Annex 6.6.2*.

The analytical results are presented in the detailed report in *Annex 6.6.2*. A summary of the values of physicochemical parameters of groundwater is included in *Table 6-13*. Field parameters measured at site are presented and are in accordance with analytical results.

Table 6-13 Field Parameters Measured during Site investigation phase for KP 0.0 – 359

No	*Sample*	*pH*	*Conductivity Ec (µs/cm)*	*Temperature (°C)*	*Turbility NTU*
Limit values		***6.5 – 9.5***	***2,500***		
BE1	GWE-1	7.40			
BE31	GWE-2	7.40			
BE44	GWE-3	7.40			
BE20	GWE-4	7.40			
BE38	GWE-5	7.60			
BE51	GWE-6	7.15	390	21.2	0.20
BE52	GWE-7	6.90	300	22.0	0.31
BE53	GWE-8	7.50	355	15.7	0.93
BE54	GWE-9	7.32	419	16.8	1.14
BE55	GWE-10	7.03	615	18.0	0.62
BE56	GWE-11	7.40	464	17.2	1.27
BE57	GWE-12	7.30	586	18.3	0.59
BE58	GWE-13	7.52	458	20.3	0.18
BE59	GWE-14	7.45	760	20.5	0.18

Limit values according to Directive 2006/118/EC and JMD 145116/2011 (HGG 354/B/08.03.2011)
Note: The first column is the Code number of examined borehole and the second the sampling site

Source: ASPROFOS, HCMR, EXERGIA and Agrolab (2013)

Table 6-14 Field Parameters Measured during Site Investigation Phase for KP 359 – 543.2

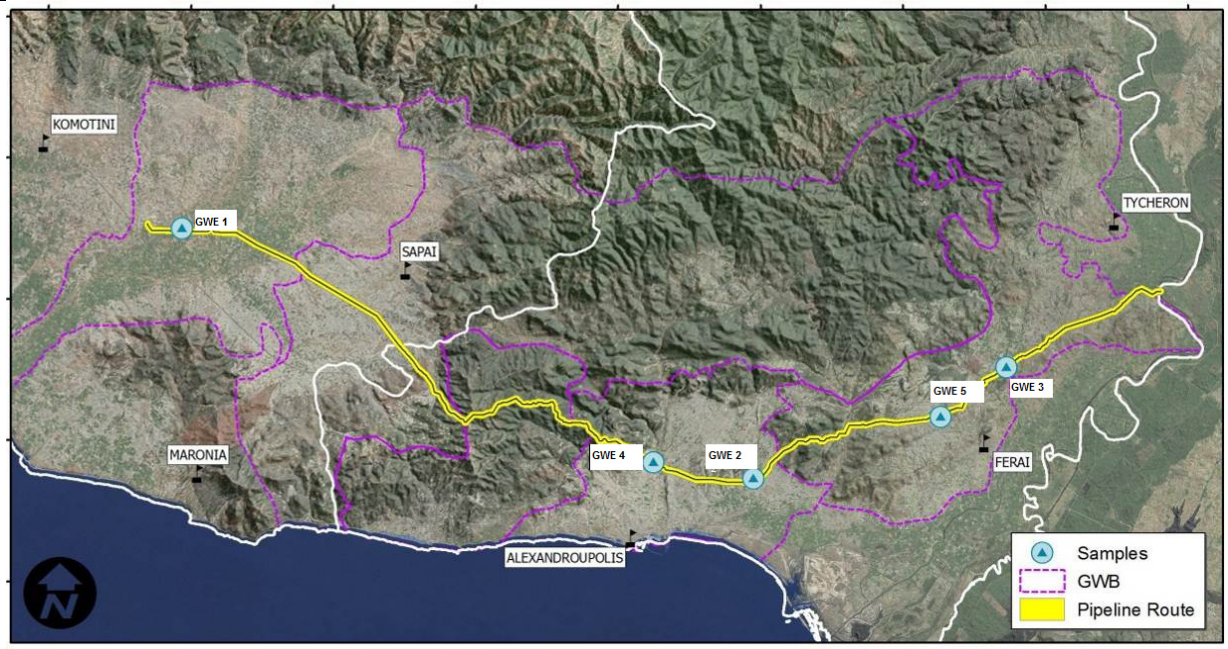
No	*Sample*	*pH*	*Conductivity Ec (µs/cm)*	*Temperature °C*	*Eh (mV)*
Limit values		***6.5 – 9.5***	***2,500***		
B7	GW3	7.64	675	18.7	265
B16	GW4	7.53	746	17.8	268
B28	GW5	7.88	690	16.5	243
B32	GW6	7.05	393	17.3	283
B42	GW7	7.56	613	14	222

Limit values according to Directive 2006/118/EC and JMD 145116/2011 (HGG 354/B/08.03.2011)
Note: The first column is the Code number of examined borehole and the second the sampling site

Collated by ERM (2011)

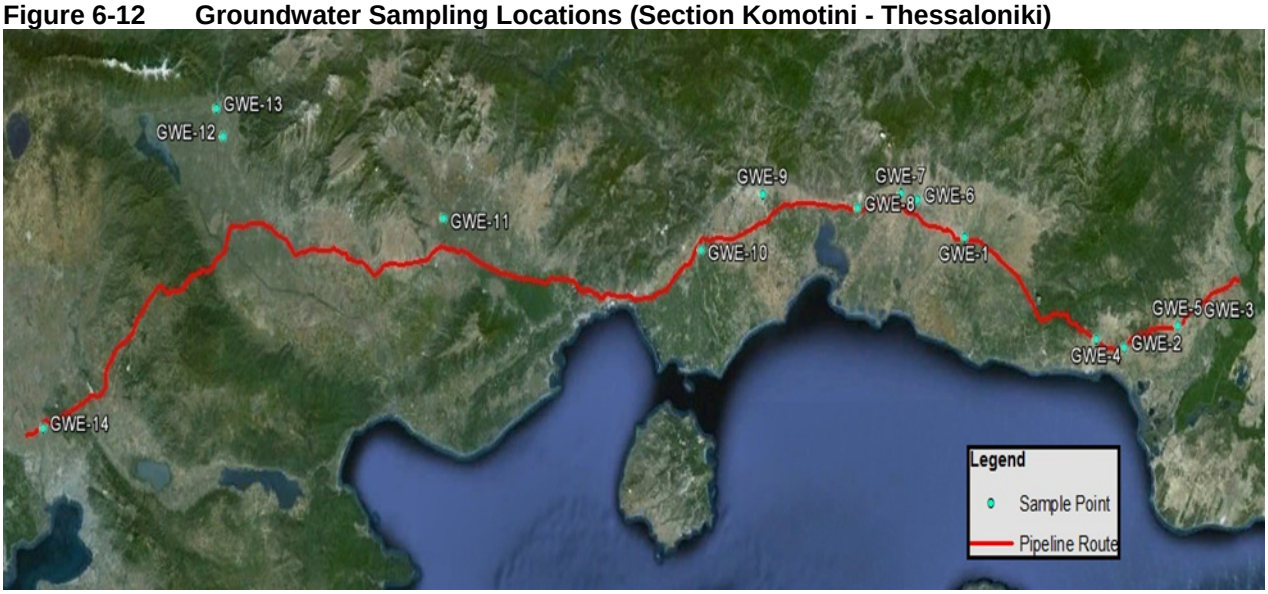
The pH and conductivity values are within the limit values for all samples throughout the route.

Figure 6-11 Groundwater Sampling Locations (Section Kipoi - Komotini)



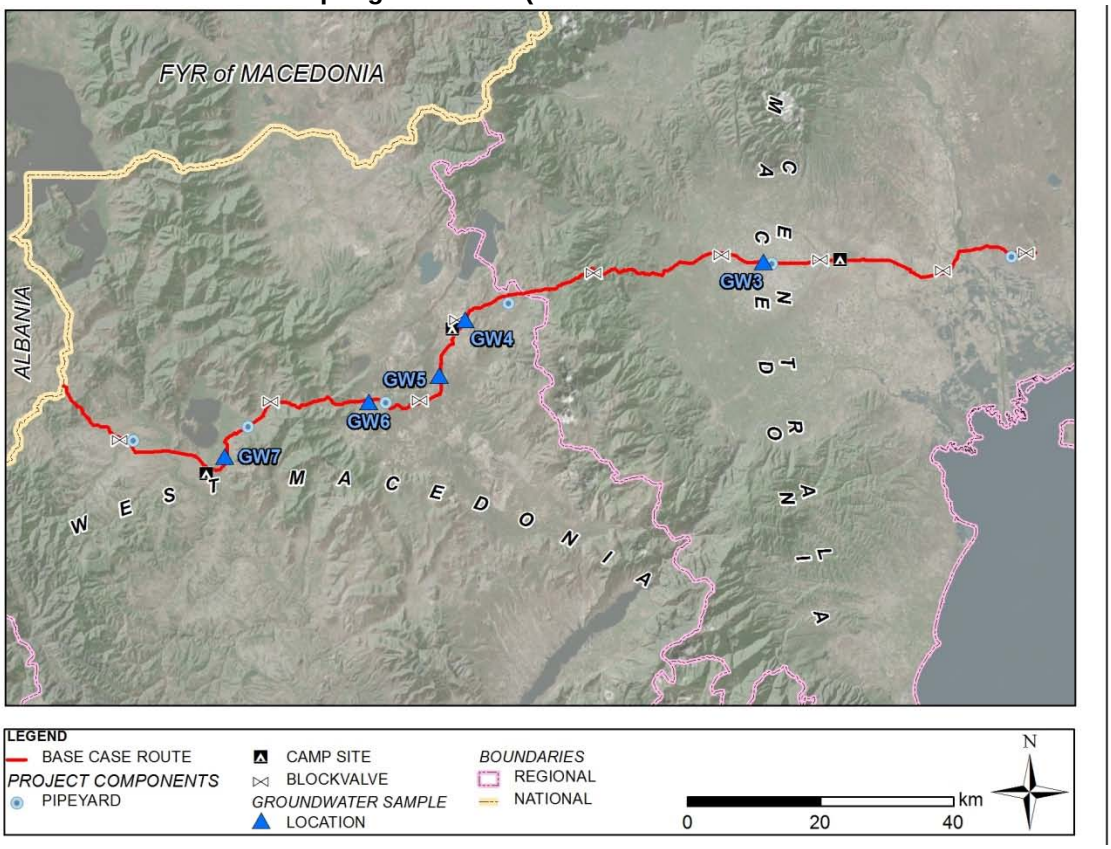
Source: EXERGIA (2013)

Figure 6-12 Groundwater Sampling Locations (Section Komotini - Thessaloniki)



Source: ASP (2013)

Figure 6-13 Groundwater Sampling Locations (Section Thessaloniki – Greek/Albanian Border)



Source: ERM (2011)

A summary of the values of the physicochemical parameters of the groundwater samples collected during the site investigation is given in *Table 6-15* for the Section Kipoi – Thessaloniki (KP 0 – 359) and in *Table 6-16* for the Section Thessaloniki – Greek/Albanian borders (KP 359 – 543).

It should be noted, that due to the absence of physicochemical threshold values in the European groundwater legislation referring to Greece, national legislation regarding effluents quality is used for comparison. The referenced national legislations, JMD 5673/400/05.03.1997 (HGG 192/B/14.03.1997) and JMD 145116/2011 (HGG 354/B/08.03.2011), are the most relevant.

Table 6-15 Values of Physicochemical Parameters of groundwater for KP 0.0 – 359

No	*Sample*	*TDS mg/l*	*BOD mg/l O_2*	*COD mg/l O_2*	*TOC mg/l*	*DO mg/l*	*TSS mg/l*
Limit values		***-***	***25[2)]***	***125[2)]***	***10[1)]***	***-***	***35[2)]***
BE1	GWE1	982.00	ND	ND	2.85	6.07	ND
BE31	GWE2	845.00	ND	ND	1.05	5.94	ND
BE44	GWE3	370.0	ND	ND	0.95	4.81	ND
BE20	GWE4	483.0	ND	ND	1.10	3.82	ND
BE38	GWE5	466.0	1	ND	1.05	7.0	ND
BE51	GWE6	253.5	1	2.8	0.52		0.37
BE52	GWE7	195.0	1	2.1	0.36		0.57
BE53	GWE8	230.7	1	1.5	0.42		1.72
BE54	GWE9	272.3	1	3.2	0.74		2.11
BE55	GWE10	399.7	1	1.5	1.30		1.15
BE56	GWE11	301.6	1	6.4	1.41		2.35
BE57	GWE12	380.9	1	1.9	0.74		1.09
BE58	GWE13	297.7	1	1.5	0.69		0.33
BE59	GWE14	494.0	1	1.5	0.9		0.33

Limits based on [1)]JMD 5673/400/05.03.1997 (HGG 192/B/14.03.1997) and [2)]EU Directive 91/271/EEC.
Note: The first column is the Code number of examined borehole and the second the sampling site
ND means Not detected

Source: ASPROFOS, HCMR, EXERGEIA and AGROLAB (2013)

Table 6-16 Values of Physicochemical Parameters of groundwater for KP 359 – 543

No	*Sample*	*pH*	*BOD mg/l O_2*	*COD mg/l O_2*	*SS mg/l*	*DO*
Limit values		***6.5 – 9.5[1)]***	***25[2)]***	***125[2)]***	***-***	***-***
B7	GW3	7.8	ND	ND	ND	6.1
B16	GW4	7.0	ND	ND	ND	7.6
B28	GW5	7.8	ND	ND	ND	8.4
B32	*GW6*	7.9	ND	ND	ND	6.8
B42	*GW6*	7.4	20	10	ND	0.1

Limits based on [1)]JMD 5673/400/05.03.1997 (HGG 192/B/14.03.1997) and [2)]EU Directive 91/271/EEC.
Note: The first column is the Code number of examined borehole and the second the sampling site

Collated by ERM (2011)

The physiochemical values are within the limit values for all samples throughout the route.

A summary of the analytical results of the groundwater samples collected during the site investigation is given in *Table 6-17* for the Section Kipoi – Thessaloniki. Further detail of this analysis, plus the analytical certificates from HCMR and from AGROLAB, are presented in *Annex 6.6.2*.

Table 6-17 Values of Chemical Analysis Parameters KP 0.0 – 359

No	Sample	Cl mg/l	PO_4 mg/l	SO_4 mg/l	$N0_3$ mg/l	$N0_2$ mg/l	NH_4 mg/l	Total Oil mg/l	Animal& Vegetable Oil & Fat mgc/l	Total Coliforms Cfu/100ml	PAH ng/l
Limit values		***250***[1)]	***1***[1)]	***250***[1)]	***50***[2)]	***0.5***[1)]	***1.5***[1)]	**-**	**-**	***≤200***[1)]	***300***[1)]
BE1	GWE1	182.00	ND(as P_2O_5)	**281.00**	**122.000**	ND		ND		53	ND
BE31	GWE2	130.00	ND(as P_2O_5)	244.00	22.500	ND		ND		49	0.02
BE44	GWE3	35.80	ND(as P_2O_5)	139.00	7.300	ND		ND		0	ND
BE20	GWE4	65.10	ND(as P_2O_5)	172.00	ND	ND		ND		>100	ND
BE38	GWE5	44.00	ND(as P_2O_5)	77.40	35.800	ND		ND		0	0.18
BE51	GWE6	25.83	0.28	17.66	21.470	< 0.016	0.031	0.01	<0.01	<4	2.40
BE52	GWE7	17.14	0.22	8.31	11.830	< 0.016	0.024	0.10	<0.01	<4	2.60
BE53	GWE8	11.54	0.10	28.97	12.370	< 0.016	0.042	0.06	<0.01	<4	2.70
BE54	GWE9	16.81	0.16	35.19	13.210	< 0.016	0.024	0.10	<0.01	<4	3.10
BE55	GWE10	12.69	<0.08	60.15	11.230	< 0.016	0.069	0.34	<0.01	<4	2.70
BE56	GWE11	9.78	0.15	1.83	0.925	0.021	1.530	0.10	<0.01	<4	2.30
BE57	GWE12	13.45	0.23	37.02	23.060	< 0.016	0.018	0.05	<0.01	<4	2.70
BE58	GWE13	8.04	0.19	37.46	2.740	< 0.016	0.021	0.06	<0.1	<4	2.80
BE59	GWE14	199.12	0.08	163.11	13.080	< 0.016	0.038	0.12	<0.1	<4	3.20

Limit values according to [1)]JMD 145116/2011 (HGG 354/B/08.03.2011) and [2)]Directive 2006/118/EC
Note:The first column is the Code Number of examined borehole and the second the sampling site

Source:ASPROFOS, HCMR, EXERGIA and Agrolab (2013)

Sample GWE1 shows increased values in all the analytes. SO_4 and NO_3 concentration is above limits. This outlier value is probably related to gravitational return irrigation flows (enriched with fertilisers) in the sampled bore and also in accordance to pre-existing data for the area. Increased values are also present in sample GWE2 for SO_4 (but within the limits) attributed to gravitational return irrigation flows (enriched with fertilisers) in the shallow unconfined aquifer.

A summary of the analytical results of the groundwater samples collected during the site investigation is given in *Table 6-18* for Section Thessaloniki – Greek/Albanian border. Further

detail of this analysis, plus the analytical certificates from AGROLAB, are presented in *Annex 6.6.2*.[12]

Table 6-18 Groundwater Samples Analytical Results KP 359 – 543

No	*Sample*	*Na (mg/l)*	*Cl (mg/l)*	*SO_4 (mg/L)*	*NO_3 (mg/l)*	*NO_2 (mg/l)*	*P (mg/L, P_2O_5)*
Limit value		***200***[1)]	***250***[1)]	***250***[1)]	***50***[2)]	***0.5***[1)]	***1***[1)]
B7	GW3	15.7	12.1	79.5	20.4	0.21	ND
B16	GW4	16.7	20.6	44.2	44.7	ND	ND
B28	GW5	15.3	30.5	51.1	48.1	ND	ND
B32	GW6	19	12.8	20.3	20.4	ND	ND
B42	GW7	1	10	20	2	0.03	1.14

Limit values according to [1)]JMD145116/2011 (HGG 354/B/08.03.2011) and [2)]2006/118/EC

Collated by ERM (2011) and ASPROFOS (2013)

All measured values are within the limits. Further data and analytic results are provided in *Annex 6.6.2*.

6.2.4.5 Results

Section Kipoi – Thessaloniki KP 0 - 359

The results show generally values below the Groundwater Threshold Values of the 2006/118/EC and JMD 145116/2011 (HGG 354/B/08.03.11). The concentrations of nitrite, phosphate, chloride are below the screening values according to the above legislation. Near Evros river, there are inceased values of SO_4 and NO_3, e.g sample GWE1 shows SO_4 and NO_3 concentration above limits and sample GWE2 an increased value (above limit) for NO_3. These outlier values are probably related to gravitational return irrigation flows (enriched with fertilisers) in the sampled bores and also in accordance to pre-existing data for the area. BOD, COD, Suspended Solids, P, and NO_2 values are very low, which indicates low organic loads. For ammonium concentration, one sample at Aggitis river exceeds the screeing value of 1.5 mg/l. This implies indicative pollution impact from agrochemical and/or urban waste.

[12] A review of existing groundwater quality data was also completed for boreholes located within a 2 km buffer of the proposed pipeline route. The review identified 119 boreholes within this buffer and the available data collected was used as a reference for assessing the baseline groundwater quality in the vicinity of the pipeline route. *Supplement II* in *Annex 6.6.2* presents the analytical results of the 69 available samples. *Supplement III in Annex 6.6.2* presents the Physicochemical Analyses - Laboratory Test Reports of the seven samples collected during the field survey.

Section Thessaloniki – Albanian borders KP 359 - 543

The results show values below the Groundwater Threshold Values of the 2006/118/EC and JMD 145116/2011 (HGG 354/B/08.03.11). BOD, COD, Suspended Solids, P, and NO_2 could not be detected in the majority of the water samples. No oil or grease was detected in any of the samples.

6.2.4.6 Ground Water Use

Section Kipoi – Komotini KP 0 - 87

The groundwater bodies crossed by the pipeline route provide groundwater for two major uses- irrigation and public water supply. The groundwater pumped from the 50 boreholes that were recorded during the site investigation phase within the 500 m buffer from the pipeline route are used for irrigation of fields. No further data was available regarding public water supply abstractions for the remaining extent of the groundwater bodies crossed.

Section Komotini – Thessaloniki KP 87 - 359

The groundwater from boreholes from Gallikos, Kosinthos and Xiropotamos provide groundwater for domestic use. The groundwater pumped from the other boreholes provide water for irrigation supply.

Section Thessaloniki – Albanian borders KP 359 - 543

The groundwater bodies that are crossed by the pipeline route provide groundwater for two major uses- irrigation and public water supply. The groundwater pumped from the 27 boreholes that were recorded during the site investigation phase within the 500 m buffer from the pipeline route are used for irrigation of fields. The exception is B5 (see location in *Annex 6.6.2*) which is used for the provision of drinking water to the municipality of Agios Athanasios. No further data was available regarding public water supply abstractions for the remaining extent of the groundwater bodies crossed.

6.2.5 Surface waters

The major watercourses of permanent flow that are crossed by the pipeline proposed route are Evros, Provatonas, Fytemata, Apokrimno (Erene), Filioiuris, Chionorema, Aspropotamos, Xiropotamos (Kompsatos), Xanthi (Kosinthos), Nestos, Aggitis Ditch, Aggitis, Krousovitis, Strymonas, Gallikos, Axios, Loudias, Aliakmonas

Evros is the largest river of Greece. It is the natural border between Greece and Turkey and it originates from the neighbouring Bulgaria and Turkey. It is considered as a polluted river by urban and industrial point sources of pollution as well as agricultural non-point sources. Although the pipeline crosses few kilometres from the estuaries, the substrate is not as fine as would expected due to the rocky hill on the Greek bank.

The Provatonas canal crossing is located very close to the main stem of Evros River. Provatonas is a small canal. It originates from low hills in the south-east part of Dadia forest and it flows through the valley with a southeast direction. With the parallel use of a pump-house it is used primarily as a drainage canal for the surrounding cultivation farms. It is susceptible to nutrient pollution from agricultural sources and to a lesser extent to organic pollution from the villages Provatonas and Thymaria. The substrate of Provatonas crossing is not silt, as would be expected, but it is at least partly consisted of bedrock, therefore showing signs of undercut bed scouring.

Fytemata Stream originates from the south part of Dadia forest as a lowland stream but in its lowest floodplain course it is rather a regulated drainage canal. During the summer period water is permanent only to the lowest part due to the regulation constructions (weirs, levees), the rest of the river is an intermittent river. The cross of the pipeline is taking place at the intermittent part, under the Egnatia highway. That part is usually dry during the summer, due to either recent bed and bank reinforcement-stabilisation works (gabions) or natural causes.

Erene is a small lowland stream north of Alexandroupoli. The Alexandroupoli's dump site is located close to the river bank a few kilometres upstream.

Filiouris is a medium sized river. Although the pipeline crosses many tributaries solely one is characterised by permanent water flow. It is susceptible to nutrient pollution from agricultural sources.

The discharge of Chionorema (Asprorema / Vosvozis or Bosbos river) based on bibliographic data ranges between 0.18 and 194.0 m^3/s (average discharge 3.2 m^3/s) (Giannopoulos, 2008). Based on in situ measurements conducted by H.C.M.R., the discharge in August 2012 was 0.09 m^3/s.

At Symvolo village water from Chionorema is collected for the domestic needs of Komotini (Giannopoulos, 2008). It must be noted that a dam construction by Municipal Water and Sewerage Company of Komotini, about 2 km upstream of Symvolo is under study.

For Aspropotamos stream no bibliographic data concerning the discharge was obtained. Based on in situ measurements conducted by H.C.M.R., the discharge in August 2012 was zero.

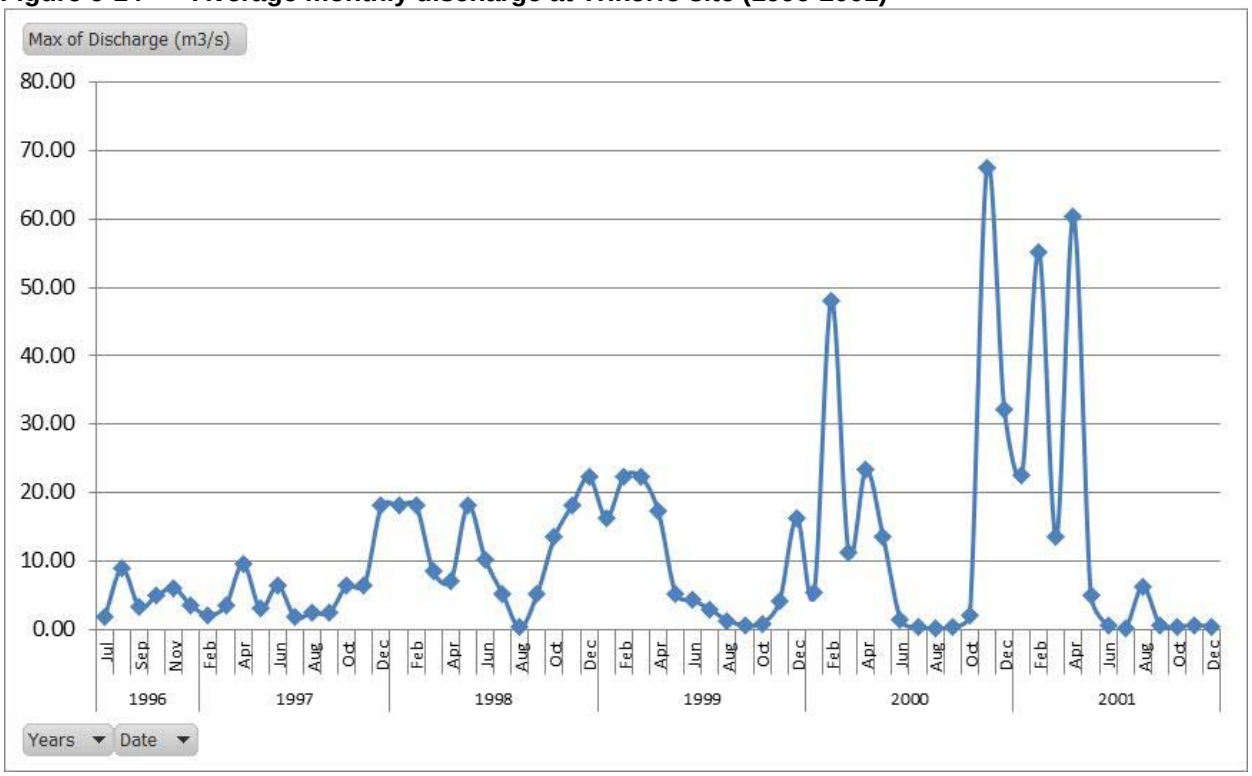
Due to dredging of Aspropotamos riverbed, the artificial hydraulic communication between the river and the artesian aquifer was accomplished. As a result, the aquifer is discharged to the stream at a rate that sometimes exceeds 1,200 m^3/h and the stream flow increases up to 40% to 1,500%, while phenomena of brackish water intrusion from Vistonida lake are observed. In the past, 3.4 km of the river was canalized and embankments 5 m wide were constructed. Fertilizers and pesticides from cultivated areas are drained toward the Aspropotamos, while effluent from livestock farms are disposed at the river (Velegraki et al., 2005).

The discharge of Xiropotamos (Kompsatos) river, based on daily hydrometric data obtained from the archives of Public Power Corporation S.A. (P.P.C.) concerning Trikorfo site, ranges between 0.03 and 67.5 m^3/s (average discharge 4.2 m^3/s). The discharge is decreased in July and September, while during August is slightly increased. Often during summer the river flow is practical zero. A long term decrease of the average monthly discharge during summer is observed (*Figure 6-14*), while during winter the risk of flooding is increased (*Figure 6-15*). Based on in situ measurements conducted by H.C.M.R..

It must be noted that sand and silt mining (240,000 m^3/year) from Xiropotamos leads to the degradation of the river. Roads and railways cross the river. In the '50s, 8 km of the river downstream was canalized and flood embankments were constructed. The main river branch

was aligned and widened and embankments 5 m wide were constructed. Because of the lack of maintenance, islets and meanders were formed and the riverbed is backfilled downstream. Due to the existence of flood embankments along Xiropotamos, no flow from streams, ditches or rivers contribute to Xiropotamos flow (Velegraki et al., 2005).

Figure 6-14 Average monthly discharge at Trikorfo site (1996-2001)

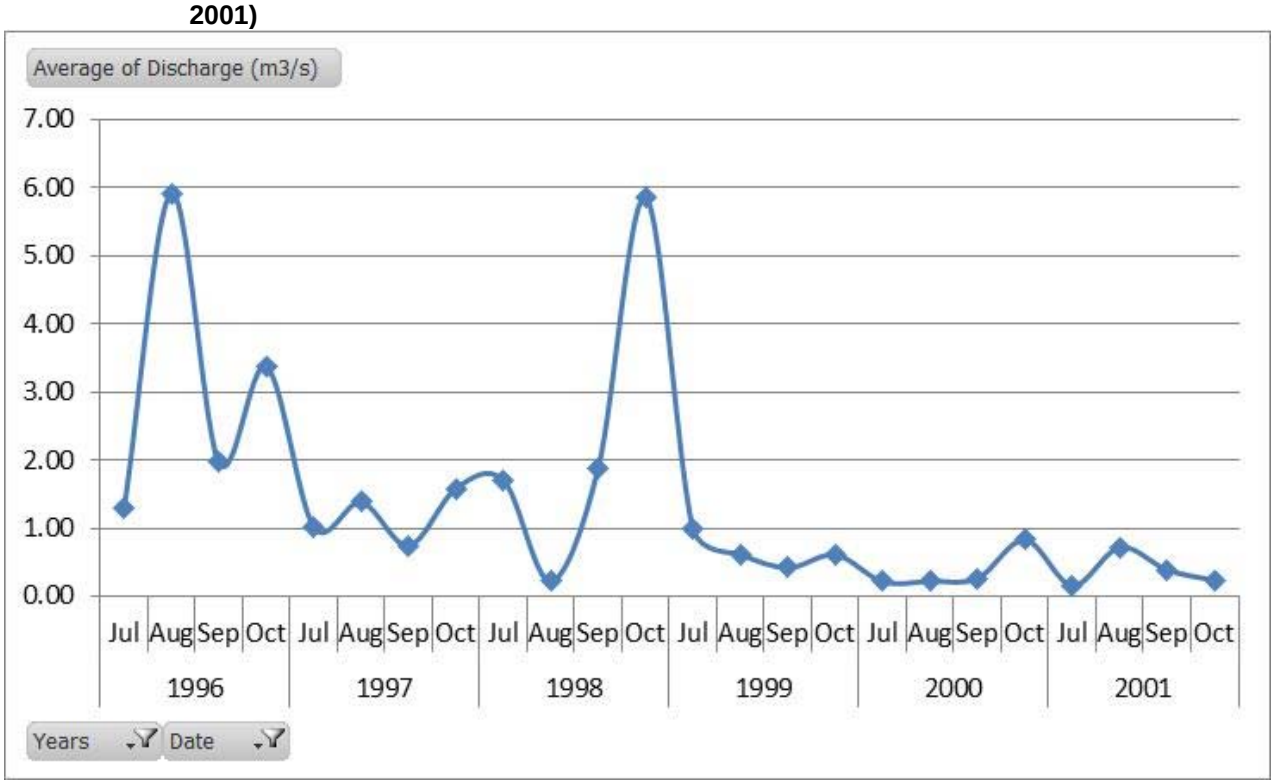


Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Nowadays, fertilizers and pesticides from Xanthi cultivated areas are drained toward the Xiropotamos, while effluent from livestock farms or urban wastes are disposed at the river. Also, waste disposal at the riverbed takes place. The only irrigation network of the wider area at Iasmos is supplied by Xiropotamos (Velegraki et al., 2005).

At Trikorfo the construction of the Polyanthos rockfill dam is under design, in order to meet the irrigation needs of the Prefecture of Rhodopi (Velegraki et al., 2005).

Figure 6-15 Average monthly discharge at Trikorfo site during summer (July - October 1996-2001)



Source: HCMR (2012) by Hellenic Ministry of Development, 2007

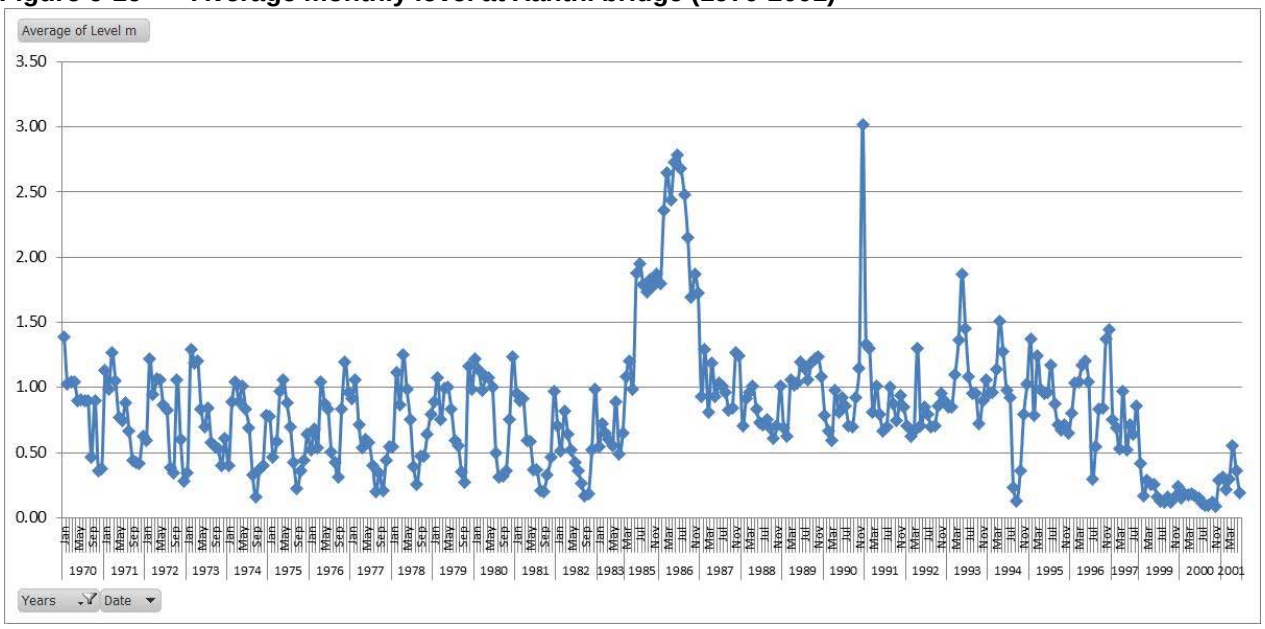
The discharge of river Xanthi (Kosinthos) based on daily hydrometric data obtained from the archives of Ministry of Environment, Physical Planning and Public Works (1960-2001) concerning Xanthi bridge (7.5 km upstream sampling point KO1), ranges between 0.05 and 11.30 m (average level 0.86 m). The average monthly level is decreased during September and October (*Figure 6-16*), while the long term average monthly level is generally decreased (*Figure* **6-17**). Based on in situ measurements conducted by H.C.M.R., the discharge in August 2012 was 0.07 m^3/s.

Roads and railways cross the river.

In 1958, Xanthi river was diverted, canalized, aligned and confined and embankment were constructed. Before, the main river branch was flowing towards northeast and finally the sea through Lafri lagoon. In case of increased river discharges, the plain was flooded. Due of these river interventions, the velocity of the river and the suspended sediment load is increased and therefore the sediment deposition at Vistonida lake is also increased. In order to contain runoff,

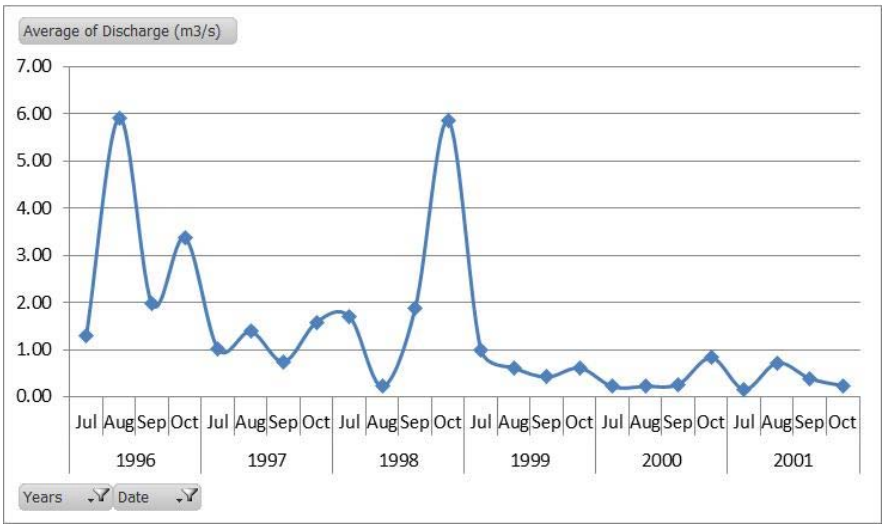
along Xanthi river upland sediment dams that were either destroyed or sediment filled were constructed (Kafetzi et al., 2009).

Figure 6-16 Average monthly level at Xanthi bridge (1970-2001)



Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Figure 6-17 Average monthly discharge at Trikorfo site during summer (July - October 1996-2001)



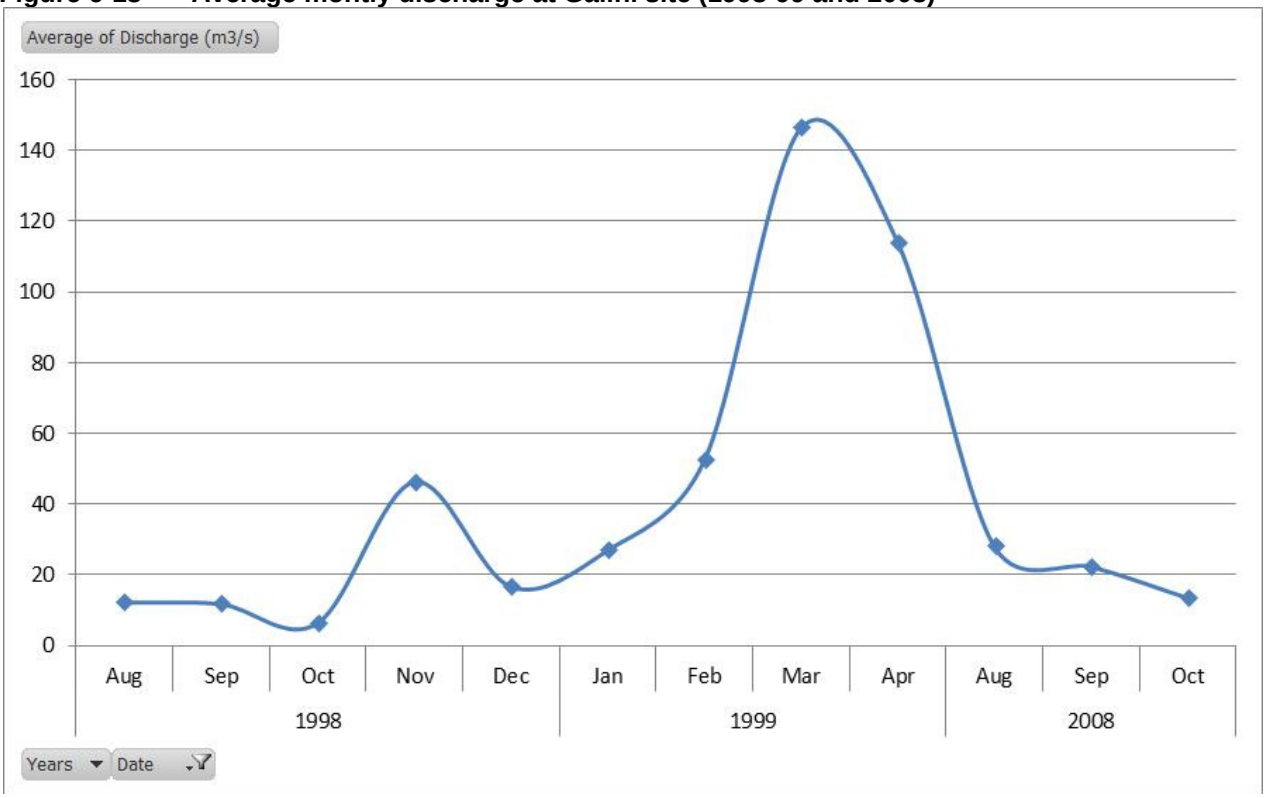
Month	Average discharge (m^3/s) (1996-2001)
July	0.89
August	1.51
September	0.94
October	2.06

Source: HCMR (2012) by Hellenic Ministry of Development, 2007

The discharge of Nestos river based on daily hydrometric data concerning Galini site (3.7 km upstream sampling point N1), ranges between 5.5 and 248.4 m^3/s (average discharge 50.7 m^3/s)

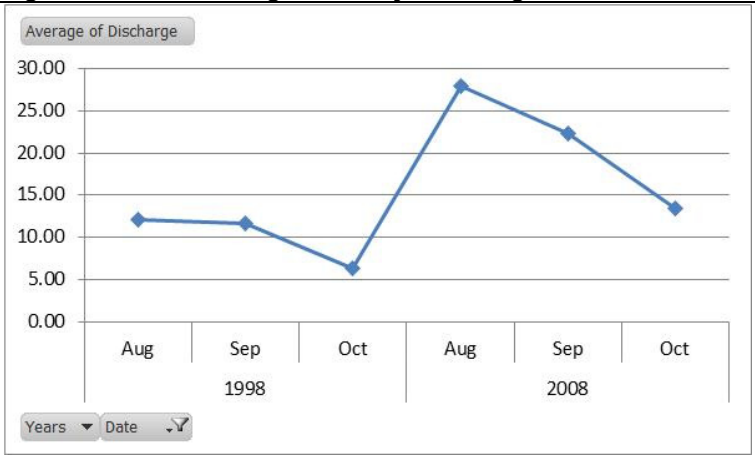
(Hellenic Ministry of Development, 2007; ENVECO & D.U.T., 2008) (*Figure 6-18*). The water discharge is low in October. During the in situ visit conducted by H.C.M.R. scientist (August 2012) it was not possible to obtain discharge measurements.

Figure 6-18 Average montly discharge at Galini site (1998-99 and 2008)



Source: HCMR (2012) by Hellenic Ministry of Development, 2007; ENVECO & D.U.T., 2008)

Figure 6-19 Average monthly discharge at Galini site during summer (1998-99 and 2008)



Month	Average discharge (m^3/s) (1998-99 και 2008)
July	-
August	20.03
September	15.19
October	9.84

Source: HCMR (2012) by Hellenic Ministry of Development, 2007; ENVECO & D.U.T., 2008)

Nestos catchment is transboundary and therefore the river discharge depends at great extent on the management practices of Bulgaria. Along Nestos river many dams are constructed. The most important of these are the Toxotes dam for irrigation (Region of East Macedonia - Thrace) and Temenos (under construction), Platanovrisi and Thisavros dams for the production of hydroelectric energy and irrigation (Public Power Corporation S.A. - P.P.C.) in Greece and Dospat dam for the production of hydroelectric energy in Bulgaria.

Roads and railways cross the river.

Water from Nestos river in Greece is withdrawn for irrigation and domestic use and the production of hydroelectric energy, in Bulgaria the water is withdrawn for irrigation, domestic use, pisciculture and tourism, while the river is also used for waste disposal and the production of hydroelectric energy. Very often urban and industrial wastes are disposed directly to Nestos river (Bournaski et al., 2006).

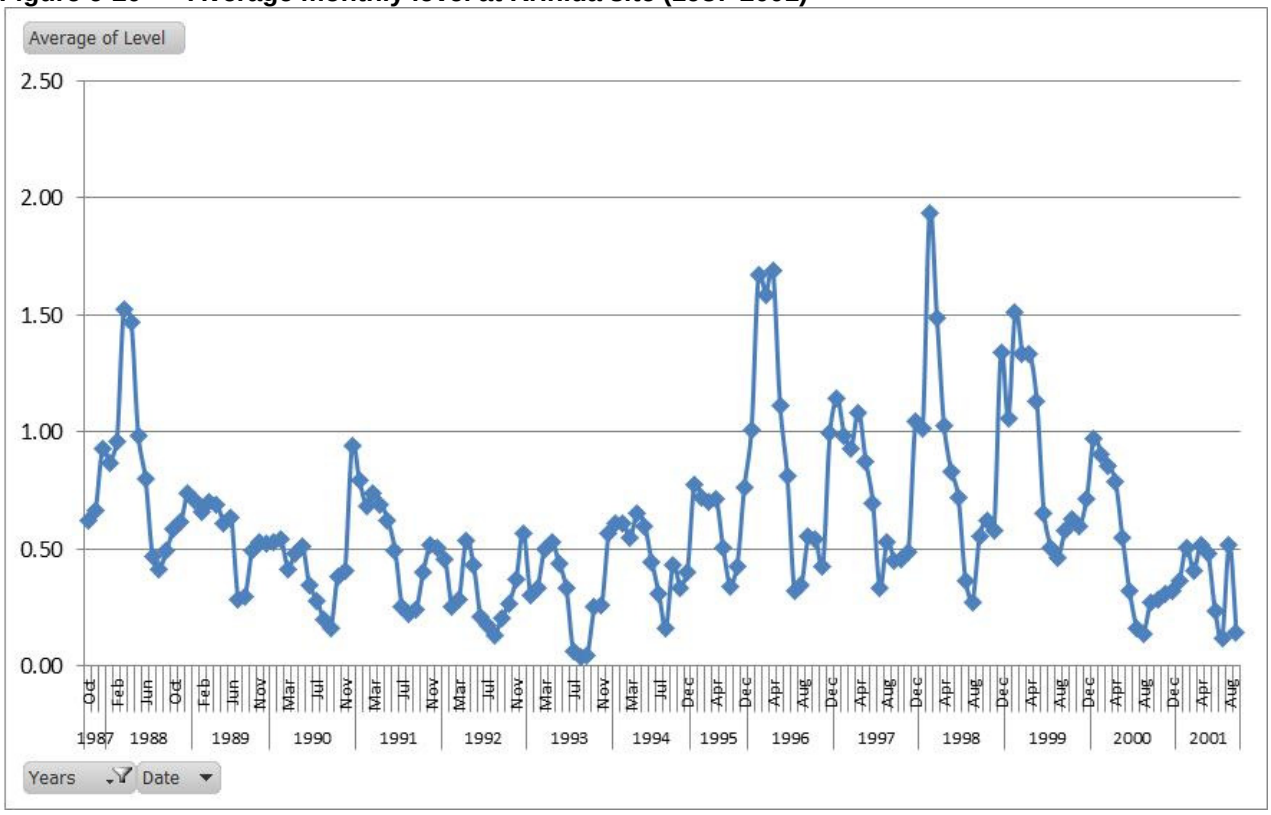
During the '50s Nestos river was aligned and confined and flood embankment were constructed. Due of these river interventions, many secondary branches ceased to exist and the velocity of the river and the suspended sediment load increased.As a result the sediment deposition in the sea has also increased, creating many consequences to the estuary system (Kakouros et a., 2005).

The water discharge of Aggitis river hydrometric data obtained from the archives of Public Power Corporation S.A. (P.P.C.) (1987-2001) concerning Krinida site (ranges between 0.03 and 3.00 m (average level 0.60 m). The average monthly level is decreased in October (*Figure 6-20*), while the long term average monthly level is increased (*Figure 6-21*). Based on in situ measurements conducted by H.C.M.R., the discharge was 2.62 m^3/s

At Aggitis river the following dams have been constructed: Tsaliki, Photovolos, Emmanoulidis, Trigono, Mavrolefki and Agios Konstantinos and Eleni. In addition, embankments have been contructed along Aggitis river.

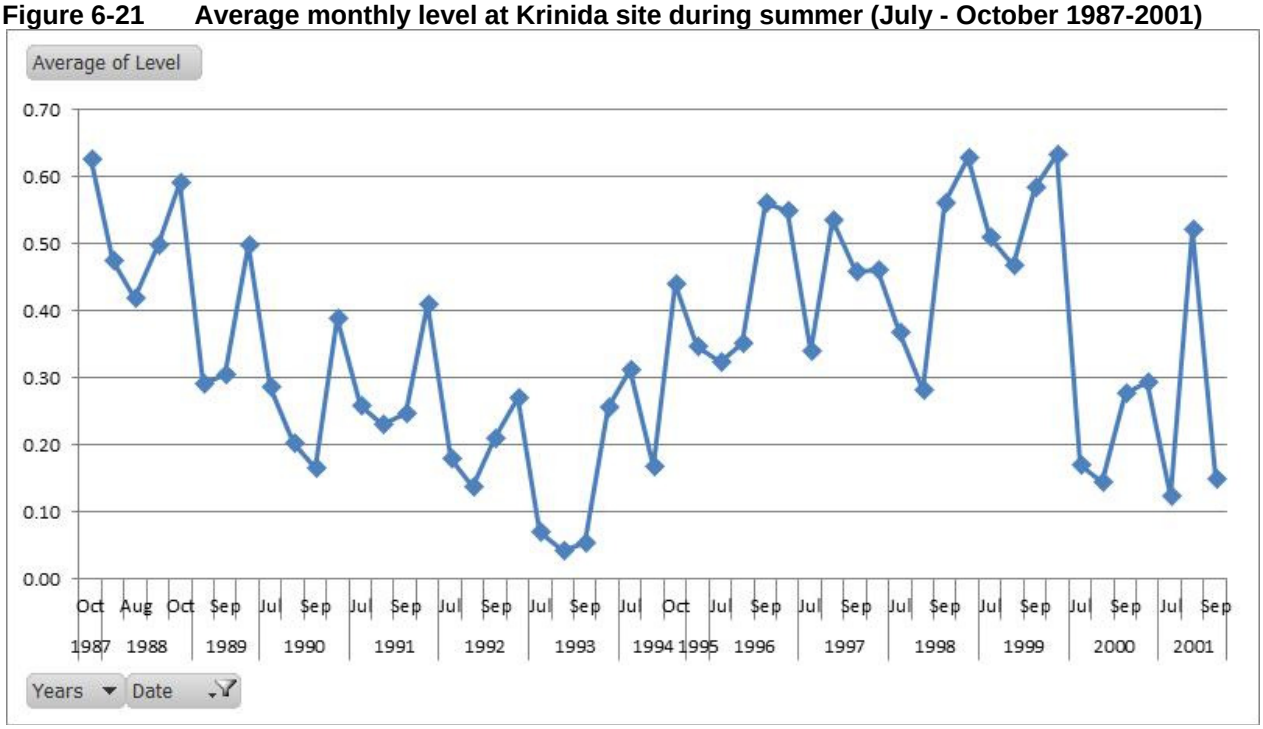
At Aggitis Ditch area during the in situ visit conducted by H.C.M.R. scientist (April 2013) it was not possible to obtain discharge measurements.

Figure 6-20 Average monthly level at Krinida site (1987-2001)



Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Figure 6-21 Average monthly level at Krinida site during summer (July - October 1987-2001)



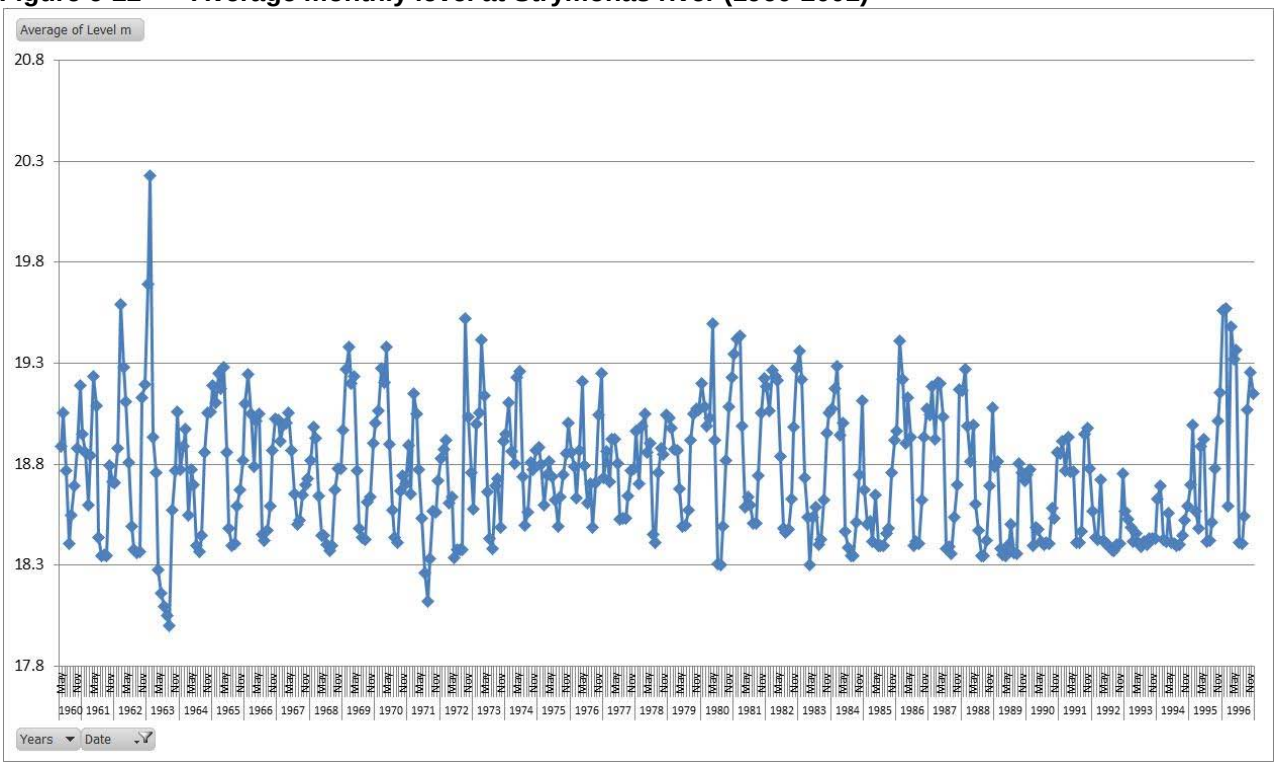
Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Bibliographic data concerning the discharge was obtained for Kroussovitis river. Based on in situ measurements conducted by H.C.M.R., the discharge was 0.09 m^3/s .

It is important to note that Krousovitis and Katharada dam are also located in the area .(Ministry of Agriculture).

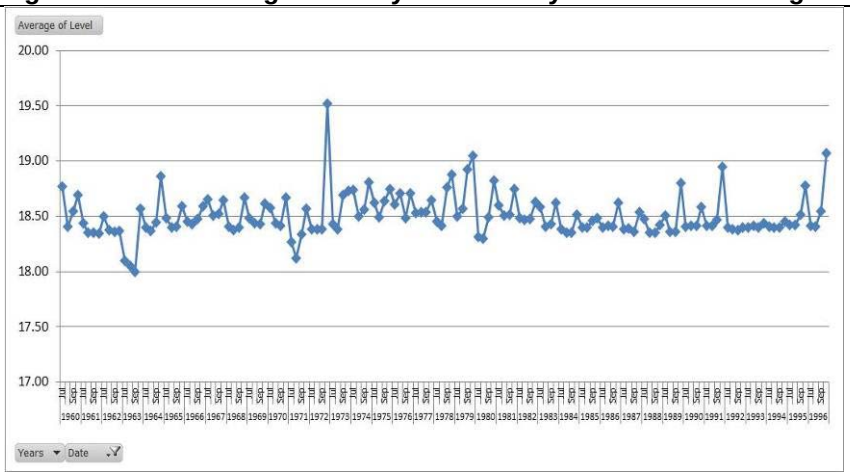
The discharge of Strymonas river based on daily hydrometric data was obtained from the archives of Ministry of Environment, Physical Planning and Public Works (1960-1996). From a sampling site located ranges between 18.0 and 21.1 m (average level 18.8 m). Overall the average monthly level is decreased in August (*Figure 6-22*), while the long term average monthly level is slightly decreased. During the in situ visit conducted by H.C.M.R. scientist (April 2013) it was not possible to obtain discharge measurements.

Figure 6-22 Average monthly level at Strymonas river (1960-2001)



Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Figure 6-23 Average monthly level at Strymonas river during summer (July - October 1960-2001)



Month	Average level (m) (1960-1996)
July	18.46
August	18.41
September	18.46
October	18.68

Source: HCMR (2012) by Hellenic Ministry of Development, 2007

Since Strymonas catchment is transboundary the river discharge and ecology depends at a large extent on the management practices of Bulgaria and F.Y.R.O.M. In Bulgaria along Strymonas river 56 small reservoirs to the Studena, Pchelina and Djakovo dams have been constructed. In Greece many small irrigation and flood dams are constructed. At Strymona, the artificial lake of Kerkini, was created after the construction of a dam at Lithotopo (1932-1936) is located. The main purpose of this dam was the prevention of floods, the control of the suspended sediment load and later ,the irrigation of Serres plain. In 1982 the construction of a bigger dam and the improvement of the eastern embankment of the old dam that had been filled with sediments were completed. Today, the lake is a wetland of national significance. Water from Strymonas is withdrawn for the irrigation of Serres plain (Chalkidis et al, 2007).

The riverbed of Strymonas from Lithotopos village (Kerkini lake) for 50 km until the Aggitis junction is artificial while embankments and irrigation channels have been constructed, in order to prevent flood events downstream, where swamps were created. The irrigation channels also drain off excess water and recharge the aquifer.

For Gallikos river no bibliographic data concerning the discharge was obtained. Based on in situ measurements conducted by H.C.M.R., the discharge in August 2012 downstream was 0.05 m^3/s, and upstream was zero.

During the last decades only during winter Gallikos river flows constantly.This due to exces water withdrawal from the river and the boreholes in operation at the wider area.

Effluent from livestock and poultry farms and industrial and urban waste are disposed of in the river and constitute its main source of pollution .(Daligkarou, 2008).

During 1928-1931 flood control constructions were completed downstream Gallikos river. The riverbed was confined along 12 km (Miliglou, 2003). Presently, Metaxochori dam is under construction for irrigation purposes in the Gallikos river.

The water supply of the wider area of Narres by Thessaloniki Water and Sewerage Company is accomplished by water withdrawal construction in Gallikos riverbed (three (3) wells with horizontal radial boreholes and seven (7) shallow vertical boreholes). The amount of water withdrawn from Gallikos river ranges between 5,000 m^3/d and 25,000 m^3/d (Kollias, 2011).

The main water bodies crossed by the TAP route in Central Macedonia are the rivers Axios and Loudias.

The sources of Axios River are in the mountainous area between Albania and the Former Yugoslav Republic of Macedonia (FYROM). The total river basin amounts to 22,250 km^2, from which the last section of the river in Greek territory covers 1,636 km^2.

The water volume of Axios in Greece depends on the water management policy of FYROM. According to measurements during 1950 – 1960, the river flow was estimated at 170 m^3/s while based on data from 1985 – 1995 the flow was estimated at 90 m^3/s. The minimum (agreed) flow of Axios at the border for the month of July nowadays is 29.5 m^3/s. Sporadic measurements at Axios Basin estimate that the discharge of the Geek section of the basin is 6 m^3/s (Koutsoyiannis, D. *et al.* 2008).

Loudias river is located between Axios and Aliakmonas and its basin covers an area of 1,215 km^2. According to sporadic measurements the discharge to the sea amounts to about 10 m^3/s, from which 3 m^3/s are the discharge of the Loudias Basin while the rest are irrigation waters in excess, diverted from Aliakmonas and Axios.

The hydrographic network of Western Macedonia is dominated by the Aliakmonas River, which is the longest river in Greek territory (314 km). The river has significant potential for hydropower

(HP) production and already supports a number of such facilities. However, no existing HP facilities are located near the crossing points of the proposed pipeline route.

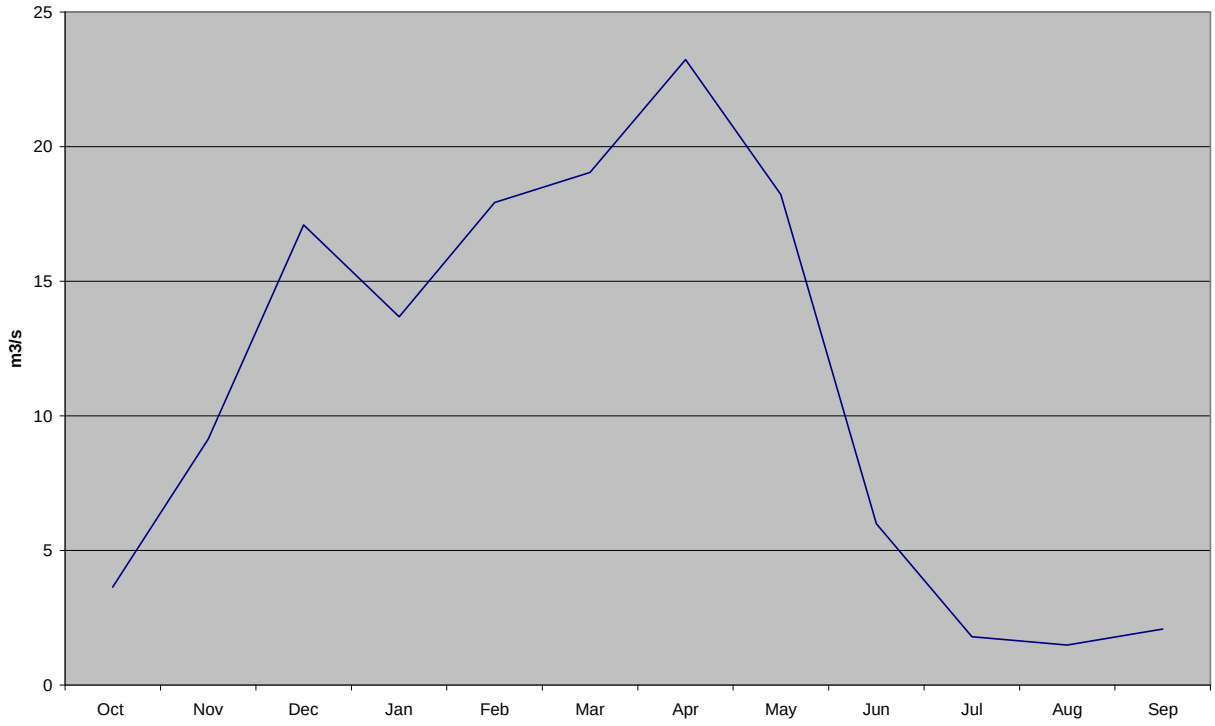
Table 6-19 Hydropower in the Aliakmonas Catchment

	Ilarion	*Polifito*	*Sfikia*	*Asomata*	*Varvares*
River basin (km²)	5005	5800	6000	6100	6150
Lake area (km²)	21.9	74	4.3	2.6	0.4
Upper lever (m)	403	291	146	85	42
Installed power (MW)	180	360	315	108	-

Source: PPC (2011)

Nevertheless, due to HP research within the catchment flow data is available for the Aliakmonas River basin; a number of hydrographic stations have been installed along the Aliakmonas and its tributaries by different authorities (PPC, Ministry of Agriculture, Ministry of Environment). The closest measuring station to the proposed pipeline route is in Argos Orestiko. Flow measurements at this location for the period 1996 – 2001 (ENM, 2008) are shown in *Figure 6-24*.

Figure 6-24 Mean Monthly River Flow Data (m^3/s) for 1996 – 2001



Source: PPC (2011)

According to these measurements, the mean annual water flow ranged from 4.4 m^3/s (2000 – 2001) to 10.5 m^3/s (1996 – 1997). March and April are the months with the highest water

volumes. The max value in this period was recorded at 41.9 m^3/s (April 1999) and the min value at 0.9 m^3/s (August 2001).

General information about the water basin of major rivers crossed by TAP pipeline is presented in *Table 6-20* below.

Table 6-20 Basic information on the major river crossed by the TAP pipeline

River Name	***Catchment Area* (km^2)***	***Discharge (km^2/year)***	***Length (km) *****	***Number of large dams (>10 m)***
Evros	53,000	3,248	528	15
Filiouris	1,486	0.155	44	1
Chionorema (Asprorema/Vosvozis or Bosbos River)	129.6	0.101	29.23	
Aspropotamos	32.7		13.86	
Xiropotamos (Xiropotamos)	557.1	0.132	64.36	
River of Xanthi (Kosinthos)	326.8	0.002***	38.16	
Nestos River	2,126.1	1,599	122.91	3 (+1 in Bulgaria)
Aggitis Ditch	*748.4*	-	*49.48*	-
Agitis River	1,993.9	0.252	51.67	
Krousovitis River	419	0.013	41.63	2
Strymonas River	1061	1,829	60.59	1 (+3 in Bulgaria)
Gallikos River	921.9	0.002***	50.81	1
Axios	1,614	788.0	76	1
Loudias	1,409	394.2	39	
Aliakmonas	21,200	578.1	350	3

* Catchment area of the stream/river upstream the sampling site

** Stream/River length of the main branch upstream the sampling site (Greek part)

*** August 2012

Source: HCMR, Ministry for Development, Competitiveness and Shipping (2006). Water resources management plans per water District. Development of management systems and tool of the water resources.

6.2.5.1 Surface Water Features in the Project Area

The following surface water features were sampled along the pipeline route:

Table 6-21 Surface Water sampling locations along the pipeline route

River name	*Water type*	*Sample*	*lon*	*lat*	*EGSA '87 (x)*	*EGSA '87 (y)*
Evros	RIVER	Evros 12	40.977923	26.326164	695558	4538626
Provatonas	CANAL	Par_Evros	40.978214	26.323967	695372	4538653
Fytemata	STREAM / SEASONAL FLOW	Fyt_1	40.939031	26.196696	684773	4534026
Aporkimno (Erene)	STREAM/ SEASONAL FLOW	Apokrimno	40.888065	25.903209	660189	4527788
Filiouris	RIVER	Filiouris	41.037093	25.582532	632872	4543795
Chionorema	RIVER	CH1	41.110996	25.211103	601538	4551500
Aspropotamos	RIVER	AS1	41.118564	25.313060	610086	4552464
Xiropotamos (Kompsatos)	RIVER	X1	41.098442	25.367011	61465	4550300
Kosinthos	RIVER	KO1	41.095964	24.953331	579913	4549563
Nestos	RIVER	N1	41.060242	24.756765	563439	4545435
Aggitis Ditch	CHANNEL	TA1			506181	4542382
Aggitis	RIVER	A1			502729	4543104
Krousovitis	RIVER	K1			452125	4547450
Strymonas	RIVER	S1			446191	4543164
Gallikos	RIVER	G1	40.752777	22.828858	400988	4511688
Axios	RIVER	Ax1	40.735333	22.653500	386135	4509398
Vardarovasi	RIVER	Vr1	40.729335	22.645446	385464	4509308
Loudias	RIVER	Lu1	40.729667	22.433833	365463	4509518
Canal 66	CHANNEL	C66	40.742833	22.170667	345879	4510579
Grammatiko	STREAM/ SEASONAL FLOW	GR1	40.688107	21.830185	316501	4506113
Koilada	STREAM/ SEASONAL FLOW	Ki2	40.557167	21.715333	308118	4499715
Kastro stream	STREAM/ SEASONAL FLOW		40.628833	21.734000	308203	4499737
Kastoria (Gioli) canal	CHANNEL	LK1	40.454833	21.318333	272574	4481407
Aliakmonas I	RIVER	AL1	40.484333	21.235167	265543	4484548
Aliakmonas II	RIVER	AL2	40.492667	21.165667	259804	4485847
Aliakmonas III (Vrachopotamos)	RIVER	AL3	40.511167	21.125833	256479	4488036

Source: HCMR(2012, 2013), EXERGIA (2012)

The flow rates recorded at these locations is presented in *Table 6-22*:

Table 6-22 Hydrological Data at Pipeline water course - river crossings

Surface water Feature	*Stream flow rate (m^3/sec)*	*Date of Measurement*
Evros	Not Measured	October 2012
Provatonas (Par. Evros)	0 (dry bed)	October 2012
Fytemata	1 (dry bed)	October 2012
Apokrimno (Ereue)	0,006	October 2012
Filiouris	0,109	October 2012
Chionorema	0,09	August 2012
Aspropotamos	0	August 2012
Xiropotamos (Kompsatos)	0	August 2012
Xanthi (Kosinthos)	0,07	August 2012
Nestos	Not Measured	August 2012
Aggitis Ditch	Not Measured	April 2013
Aggitis	2,62	April 2013
Krousovitis	0,09	April 2013
Strymonas	Not Measured	April 2013
Gallikos	0,05	August 2012
Axios	37.75	19 June 2011
Vardarovasi	0.1	19 June 2011
Loudias*	2.85	19 June 2011
Channel 66	6.98	18 June 2011
Grammatiko Stream	0.22	18 June 2011
Kastro River		
Kilada Stream	1.2	18 June 2011
Gioli canal	0.37	17 June 2011
Aliakmonas I	9.64	17 June 2011
Aliakmonas II	4.6	17 June 2011
Aliakmonas III	0.28	17 June 2011

* Not at proposed crossing

Source: ERM (2011), HCMR(2012,2013), EXERGIA (2012)

Field parameter measurments results for surface water can be found in *Annex 6.5.7* (Hydrobiology).

A summary of the results of physicochemical parameters measurments and laboratory analysis of the water samples collected during the site investigation is given in *Table 6-23*.

The physicochemical parameters presented in the above table provide only a snapshot of the corresponding values in the rivers, at the specific time of the surveys. These may strongly vary between seasons according to different meteorological and hydrological conditions.

Biological parameters (such as macroinvertebrates, diatoms etc) provide a more holistic understanding of the water bodies quality. These are presented in the relevant sections *Annex*

6.5.7 and Annex 6.5.8 and are considered as the main features for the impacts assessment (see *Section 8*).

Table 6-23 Values of physicochemical parameters of main surface water bodies

River/Stream	*PH*	*D.O (mg/l)*	*Conductivity (mS/cm)*	*Temperature (°C)*	*Salinity (ppt)*	*Turbidity (NTU)*	*TDS (mg/l)*	*BOD (mg/l)*	*NO_3^- (mg/l)*	*NO_2^- (mg/l)*	*NH_4^+ (mg/l)*	*PO_4^{3-} (mg/l)*
Evros	8.52	9.37	1.171	18.5	0.58	16.1	579	9.1	0.95	0.08	1.739	
Provatonas	7.67	7.85	0.636	18.6	0.31	3.48	309	3.5	ND*	0.057	0.165	
Fytemata												
Apokrimno (Erene)	7.78	7.85	1.192	20	0.59	4.82	590	3.83	ND*	0.069	ND*	
Filiouris	7.69	9.1	0.578	18	0.28	4.06	281	3.07	4.05	0.073	ND*	
Chionorema	7.8	4	0.926	25	0.46	12	602	3.4	3.76	0.654	6.54	1.85
Chionorema 2	7.6	2.6	1.02	25	0.5	11	663	3.5	3.4	0.75	6.3	1.64
Aspropotamos	9.78	9.4	0.353	27	0.17	21	232	2	0.58	0.035	0.126	0.16
Xiropotamos 1 (note 1)	8.5	10.9	0.205	29	0.1	24	133	3.6	<0,1	<0,016	0.082	0.09
Xiropotamos 2 (note 1)	8.9	14.5	0.159	31	0.08	275	104	3.5	0.13	<0,016	0.159	<0,08
Kosinthos 1 (note 1)	7.76	12.4	0.521	27.5	0.26	74	338	2.7	12.24	0.077	0.047	0.1
Kosinthos 2 (note 1)	7.7	13.6	0.487	28.7	0.24	84	316	3	11.6	0.08	0.052	0.13
Nestos 1 (note 1)	8.3	9.3	0.16	17.6	0.08	8.3	104	3.8	2	<0,016	0.059	0.19
Nestos 2 (note 1)	8.2	9.6	0.103	17.7	0.07	15	67	3.9	2.07	<0,016	0.082	0.19
Aggitis Ditch	6.7	9.3	0.539	20	0.26	8.7	348	1.1	10.77	0.132	0.195	0.22
Aggitis	8.13	11	0,217	16	0,1	18,5	141	3,3	8,48	0,046	0,085	0,2
Kroussovitis	8,3	9,5	0,375	20,8	0,18	50,4	243	4,4	5,13	0,174	0,118	0,53
Strymonas	8,6	9,12	0,151	22	0,07	15,4	98	2,2	0,418	0,028	0,116	0,07
Gallikos 1 (note 1)	8.67	11.3	1286	25.6		3	835.9	6.3	1.84	0.106	0.154	<0,08

River/Stream	***PH***	***D.O (mg/l)***	***Conductivity (mS/cm)***	***Temperature (°C)***	***Salinity (ppt)***	***Turbidity (NTU)***	***TDS (mg/l)***	***BOD (mg/l)***	***NO_3^- (mg/l)***	***NO_2^- (mg/l)***	***NH_4^+ (mg/l)***	***PO_4^{3-} (mg/l)***
Gallikos 2 (note 1)	7,86	7.8	1230	26.9	0.61	16	801	6.9	0.71	0.024	0.154	0.16
Axios 1 (note 2)	8.11	7.8	0.388	23.2	0.19	36.9	186.7	6.02	3.36	0.13	0,03	0.46
Axios 1 (note 2)	8.19	5,9	0.388	25.4				5	ND	-	-	0.31
Vardarovasi 1 (note 2)	7.9	6.66	0.621	27.4	0.3	7.99	302	5.48	0.49	0.21	3.08	9.51
Vardarovasi 1 (note 2)	7.6	3.9	0.841	23,2				5.5	ND	-	-	19.2
Ludias 1 (note 2)	7.65	3.85	0.595	23	0.29	7.5	289	5.15	3.32	0.24	0.2	0.74
Ludias 1 (note 2)	7.64	2.05	0.563	25.3				<LoQ	ND	0	0	0.47
Canal 66 (note 2)	8.49	8.7	0.507	26.6	0.24	9.26	245	2.65	3.98	0.15	0.24	0.58
Canal 66 (note 2)	7.3	4.65	0.623	26.8				7.5	ND	-	-	ND
Grammatiko 1 (note 2)	8.56	9.67	0.398	14.8	0.19	13.35	193.4	1.115	8.54	0.13	0.03	1.01
Koilada 2 (note 2)	7.43	4.98	0.751	18	0.37	6.22	567	1.25	7.48	0.31	0.02	1.6
Koilada 2 (note 2)	7.65	2.85	0.99	25.1				5	16.1	-	-	3.83
Kastro (note 2)	*	*	*	*				*				
Kastro (note 2)	7.84	5.4	0.679	21.4				<LoQ				3.12
Kastoria Canal (Gioli) 1 (note 2)	8.25	11.56	0.793	23.4	0.39	5.28	388	5.56	7.04	0.44	9.41	0.86

River/Stream	***PH***	***D.O (mg/l)***	***Conductivity (mS/cm)***	***Temperature (°C)***	***Salinity (ppt)***	***Turbidity (NTU)***	***TDS (mg/l)***	***BOD (mg/l)***	***NO_3^- (mg/l)***	***NO_2^- (mg/l)***	***NH_4^+ (mg/l)***	***PO_4^{3-} (mg/l)***
Kastoria Canal (Gioli) 1 (note 2)	7.84	7.15	0.827	19.2				ND	9,1	-	-	2.61
Aliakmonas 1 (note 2)	7.8	9.65	0.34	19.3	0.16	15.9	164.7	1.645	1.68	0.13	ND	<0.05
Aliakmonas 1 (note 2)	7.93	6.7	0.454	23				ND	7.9	-	-	ND
Aliakmonas 2 (note 2)	8.5	9.71	0.335	18.8	0.16	30.4	160.9	1.65	ND	0.13	ND	0.09
Aliakmonas 2 (note 2)	8.19	6.05	0.383	25.5				ND	ND	-	-	ND
Aliakmonas 3 (note 2)	8.28	10.97	0.53	15	0.26	6.08	257	3.02	1.81	0.12	ND	<0.05
Aliakmonas 3 (note 2)	8.21	6.85	0.489	24.7				ND	ND	-	-	ND

Note 1: The samples were taken in the same location upstream and downstream of the provided coordinates.
Note 2: The samples were taken in the same location, the first one in June 2011 and the second one in July 2011. For details please refer to *Annex 6.5.7*
* no discharge.
The values of surface water nutrients by rivers/ streams Evros, Provatonas, Fytemata,Apokrimno, Filiouris,Chionorema, Aspropotamo, Xiropotamo,Kosintho, Nesto, Gallikos were estimated during the period July- August 2012 while the values for the reimaining rivers was estimated during the period April 2013.
ND: Not Detected

Source: ASPROFOS (2013), EXERGIA (2012), ERM (2012)

6.2.5.2 Surface Water Use

The predominant use of water abstracted from these surface features, along the study area, is for irrigation.

6.2.6 Climate and Ambient Air Quality

6.2.6.1 Climate

Climate varies considerably all along the TAP route through Greece because the Project area is situated within a number of bioclimatic zones, such as:

- Supra-Mediterranean zone;
- Southern Mediterranean pre-mountain zone;
- Subcontinental zone;
- Oro-Mediterranean zone.

As a result of this variety of climate zones, precipitation, temperature, and other climate conditions vary along the pipeline route.

6.2.6.2 Meteorological Conditions

Long-term meteorological data from the Hellenic National Meteorological Service (HNMS) has been collected for a period of 40 - 50 years (with the exception of the Drama and Ptolemaida Meteorological Station).

Available data was used from the following meteorological stations for the periods stated:

- Lowland of Evros: Alexandroupoli 1958 – 2010
- Komotini – Xanthi Plain: Komotini 1958 – 2010
  Xanthi 1958 – 2010
  Chrysoupoli (Kavala) 1958 – 2010

- Philippoi Plain: Drama 1975 – 2009
- Serres Plain: Serres 1958 – 2011
- Axios Plain: Mikra 1934 – 2012
- Vermio Mountain slopes: Edessa 1975 – 2012
- Ptolemaida Basin: Ptolemaida 1975 – 1997
- Askion Mountain slopes: Florina 1961 – 2012 and
- Kastoria to border: Kastoria 1986 – 2012

The annual average data from these periods are displayed as windrose diagrams. *Figure 6-25* to *Figure 6-35.*

6.2.6.2.1 Precipitation

Table 6-24 to *Table 6-28* present precipitation data from the meteorological stations identified for each section of the proposed pipeline route. The annual rainfall ranges between 429 mm and 667 mm, while the highest annual rainfall was measured in Xanthi and the lowest in Chrysoupoli Kavala.

Additionally, the season with the lowest rainfall in these areas is the summer (55 -132 mm).. The rainfall range for spring (92- 175 mm), autumn (111.2 – 188.0 mm) and winter seasons (112--246.0 mm).

November is on average the wettest month at Xanthi (192.1 mm), Alexandroupoli (85.4 mm), Edessa (Vermio Mountain slopes section) (78 mm), Ptolemaida (Ptolemaida Basin section) (70 mm) and Kastoria (Kastoria-to-border section) (77 mm). and December for Komotini (102.3 mm), Kavala (760 mm), Serres (55.7 mm), Drama (68.2 mm), Mikra (Axios Plain section) (55 mm) and Florina (Askion Mountain slopes section) (87 mm).

The driest month is July for Edessa (17 mm), Kastoria (27 mm) and August for Alexandroupoli (13.3 mm), Komotini (19.4 mm), Xanthi (34.2 mm), Kavala (13.8 mm), Mikra (18.7 mm), Florina (31 mm) and September for Serres (24.4 mm), Drama (26.4 mm), for Ptolemaida (24.2 mm).

Furthermore, the month with the highest maximum daily rainfall was November for Xanthi (232.0 mm), Kavala (98.0 mm), Mikra (84 mm), Edessa (90 mm) and Ptolemaida (73 mm), December for Alexandroupoli (140.2 mm), Florina (102 mm), January for Komotini (171.8 mm), May for Serres (65.3 mm) and surprisingly July for Drama (73.2 mm) and August for Kastoria (83 mm). Finally, the area with the highest rainfall raining day's frequency is Komotini (117 rainy days) and with the highest snow frequency is Florina (27 days with snow), while Edessa is the area with the lowest rainfall frequency (54 rainy days) and Xanthi with the lowest snow frequency (2.7 days with snow) as well.

Table 6-24 Seasonal and Annual Rainfall

Station/area	*Winter*	*Spring*	*Summer*	*Autumn*	*Annual*
Alexandroupoli	199.0	118.9	60.8	163.4	542.1
Komotini	246.7	148.9	93.8	177.0	667.0
Xanthi	404.2	333.4	193.8	312.6	1244.0
Chrisoupoli / Kavala	152.6	92.0	55.6	128.9	429.2
Serres	128.2	118.8	98.3	111.2	456.5
Drama	143.7	130.4	117.0	126.5	517.6
Mikra	130.52	118.00	69.20	121.53	439.26
Edessa	179.80	145.52	73.86	179.23	552.45
Ptolemaida	112.11	150.48	132.11	144.62	539.30
Florina	195.47	175.35	100.82	188.53	659.98
Kastoria	159.66	145.65	91.92	181.97	579.19
Note: All numbers are in millimetres (mm)					

Source: HNMS (2012)

Table 6-25 Average Monthly Rainfall

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	59.9	55.1	47.0	37.2	34.7	27.8	19.7	13.3	28.5	49.5	85.4	84.0
Komotini	85.3	59.1	49.9	45.5	53.5	42.1	32.3	19.4	41.1	58.6	77.3	102.3
Xanthi	124.3	112.4	93.7	130.7	109.0	88.5	71.1	34.2	42.3	78.2	192.1	167.5
Chrysoupoli / kavala	33.8	42.8	32.8	34.1	25.1	21.1	20.7	13.8	25.3	37.1	66.5	76.0
Serres	35.3	37.2	31.4	41.3	46.1	43.4	27.8	27.1	24.4	38.1	48.7	55.7
Drama	35.8	39.7	32.5	40.2	57.7	45.2	45.1	26.7	26.4	43.4	56.7	68.2
Mikra	40.11	35.24	37.98	36.12	43.90	27.54	22.96	18.70	29.08	40.50	51.95	55.17
Edessa	46.63	49.97	43.70	47.81	54.01	22.18	17.55	34.13	24.49	76.55	78.19	57.23
Ptolemaida	32.43	32.59	41.08	54.01	55.39	35.79	67.90	28.41	24.16	50.06	70.40	47.09
Florina	57.59	50.49	55.97	60.37	59.01	36.46	33.30	31.06	48.94	68.26	71.33	87.19
Kastoria	42.98	45.03	45.25	48.87	51.53	35.22	27.15	29.55	37.36	66.93	77.68	71.65
Note: All numbers are in millimetres (mm)												

Source: HNMS (2012)

Table 6-26 Maximum Daily Rainfall

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	81.9	69.6	77.0	47.8	39.2	72.0	39.3	63.5	64.5	93.8	87.7	140.2
Komotini	171.8	83.7	52.5	58.1	55.6	43.7	65.7	28.4	85.2	86.4	85.9	111.0
Xanthi	148.0	109.8	126.2	166.2	95.6	131.0	113.2	75.2	98.4	148,0	232,0	165,8
Chrysoupoli / Kavala	31.2	64.0	29.0	33.1	41.0	230	40.8	25.0	39.4	57,0	98,0	83,4
Serres	23.4	54.7	34.9	38.6	65.3	59.3	47.1	50.9	43.3	56,3	42,5	58,9
Drama	45.1	59.6	38.8	44.6	48.1	67.4	73.2	35.6	38.0	71,4	47,9	52,3
Mikra	35.40	54.00	52.00	44.40	40.60	75.40	60.20	46.00	59.40	56.30	84.70	62.80
Edessa	71.00	65.20	43.00	67.00	59.00	55.80	29.00	45.00	42.00	83.00	90.00	65.00
Ptolemaida	33.00	38.00	41.00	44.00	45.00	60.00	42.00	36.00	44.00	43.00	73.00	26.00
Florina	36.60	38.50	63.50	50.10	54.60	61.00	42.50	43.50	99.50	99.80	83.00	102.00
Kastoria	51.90	37.90	36.50	34.40	44.40	62.50	38.20	83.90	77.10	63.10	49.50	53.40

Note: All numbers are in millimetres (mm)

Source: HNMS (2012)

Table 6-27 Number of days with rain

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*	*Total*
Alexandroupoli	10.42	8.96	9.46	10.12	9.51	6.63	4.23	3.23	4.17	7.45	9,98	11,91	96,06
Komotini	11.43	9.93	11.46	12.25	12.46	10.21	6.81	4.48	6.07	8.74	10,88	12,93	117,67
Xanthi	4.43	4.76	5.86	7.71	7.50	5.59	4.59	2.85	3.52	4.48	7,39	6,81	65,50
Chrysoupoli / Kavala	6.68	7.37	8.11	9.42	8.26	6.26	4.58	3.47	4.42	7.32	10,00	9,11	85,00
Serres	7.20	7.13	7.90	9.61	1016	731	566	531	467	603	8,34	8,60	87,92
Drama	683	718	835	1061	1133	874	640	615	490	676	8,56	9,30	95,10
Mikra	10.18	9.52	11.45	10.83	10.49	7.20	5.83	4.98	6.33	8.92	10.80	11.52	108.05
Edessa	4.12	4.43	4.76	5.84	5.53	2.88	2.54	2.45	2.94	6.16	7.06	5.83	54.55
Ptolemaida	4.67	5.23	7.76	9.30	9.86	5.88	8.25	3.93	4.50	7.32	8.23	6.65	81.57
Florina	5.88	6.65	8.36	10.44	9.53	6.19	5.26	4.75	5.89	7.83	8.98	8.10	87.85
Kastoria	6.59	6.67	8.38	10.11	10.73	6.46	5.92	5.00	6.60	9.04	10.58	9.11	95.19

Source: HNMS (2012)

Table 6-28 Number of days with snow

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*	*Total*
Alexandroupoli	3,00	2,42	1,52	0,04	0,00	0,00	0,00	0,00	0,00	0,00	0,23	1,75	8,98
Komotini	1,75	1,11	1,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,38	1,26	5,68
Xanthi	1,04	0,90	0,24	0,04	0,00	0,00	0,00	0,00	0,00	0,00	0,04	0,52	2,76
Chrysoupoli / Kavala	1,63	1,26	0,74	0,16	0,00	0,00	0,00	0,00	0,00	0,00	0,05	1,16	5,00
Serres	1,87	1,56	0,52	0,06	0,00	0,00	0,00	0,00	0,00	0,00	0,19	1,10	5,30
Drama	1,76	1,76	1,39	0,54	0,04	0,00	0,00	0,00	0,00	0,00	0,15	0,78	4,65
Mikra	2.28	1.98	0.77	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.27	1.40	6.72
Edessa	2.35	2.21	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.83	6.55
Ptolemaida	8.10	6.00	2.81	0.45	0.00	0.00	0.00	0.00	0.00	0.41	1.73	5.57	25.06
Florina	7.31	6.40	4.52	0.79	0.07	0.00	0.00	0.00	0.00	0.29	1.71	6.00	27.11
Kastoria	4.30	4.96	3.03	0.37	0.00	0.00	0.00	0.00	0.00	0.11	1.31	4.44	18.53

Source: HNMS (2012)

6.2.6.2.2 Temperature

According to the average monthly temperature data *Table* 6-29, it is easily concluded that the warmest month is July and the coldest is January. In particular, the average monthly temperature in Meteorological Stations of Alexandroupoli ranges between +5 to 26°C, Komotini +5 to 25°C , Xanthi +6 to 27°C, Chrysoupoli +6 to 26°C , Serres +4 to 27°C , Drama +5 to 27°C, Mikra (Axios Plain section) +5 to +27°C, Edessa (Vermio Mountain slopes) +4 to 25°C, Ptolemaida (Ptolemaida Basin) +3 to 24°C, Florina (Askion Mountain slopes) +1 to 23°C and Kastoria (Kastoria to border section) +2 to 24°C.

The aforementioned conclusion is also supported by the average maximum (*Table 6-30*) and minimum (*Table 6-31*) temperature data and the absolute maximum (*Table 6-32*) and minimum (*Table 6-33*) temperature data, as well.

In particular, based on these data, July appears to be the warmest month. A general conclusion that can be drawn by these data is that, as was expected temperature increases during spring, escalates during summer and gradually decreases during autumn and winter, although low temperature appears also during autumn and spring, which is justified by the number of cold wind intrusions in north-east and central Macedonia throughout the year.

Table 6-29 Average Monthly Temperature

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	5,04	5,90	8,30	13,17	18,44	23,25	25,97	25,61	21,10	15,73	10,80	6,94
Komotini	4,84	6,18	8,56	13,06	18,38	22,97	25,45	25,01	20,53	15,28	10,77	6,97
Xanthi	5,85	7,11	9,89	14,51	20,14	24,61	27,09	26,47	22,44	17,06	11,42	6,91
Chrysoupoli / Kavala	5,59	6,17	8,70	13,54	18,79	23,55	25,98	25,30	20,93	15,67	10,56	6,57
Serres	4,09	6,36	9,77	14,33	19,80	24,51	26,59	25,70	21,66	15,88	9,58	4,97
Drama	4,95	6,83	10,28	14,99	20,47	25,03	27,08	26,28	22,39	16,70	10,44	6,05
Mikra	5.34	6.82	9.84	14.31	19.82	24.65	26.97	26.37	21.94	16.43	11.17	7.01
Edessa	4.42	6.16	9.43	13.56	18.79	23.90	25.46	24.66	20.48	15.35	9.68	5.88
Ptolemaida	2.67	3.96	7.58	11.96	17.11	22.10	23.94	23.27	19.49	13.73	7.72	4.23
Florina	0.64	2.87	6.99	11.70	16.90	21.13	23.46	22.81	18.26	12.77	7.13	2.01
Kastoria	2.41	3.44	7.13	11.59	16.77	21.57	24.18	23.54	18.76	13.20	7.38	3.20

Note: All numbers are in Celsius degrees (°C)

Source: HNMS (2012)

Table 6-30 Average Maximum Temperature

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	8,61	9,78	12,20	17,16	22,49	27,31	30,36	30,50	26,24	20,38	14,85	10,57
Komotini	8,78	10,38	12,77	17,48	22,91	27,68	30,20	30,35	26,34	20,72	15,55	11,22
Xanthi	9,48	10,6	13,56	18,43	24,02	28,69	31,33	30,92	27,05	21,42	14,91	10,25
Chrysoupoli / Kavala	9,62	10,27	12,55	17,38	22,69	27,39	30,55	30,02	27,78	20,34	14,68	10,32
Serres	8,13	10,90	14,90	19,72	25,37	30,20	32,39	31,88	27,98	21,48	14,08	8,84
Drama	8,40	10,91	14,82	19,83	25,35	30,19	32,09	31,42	27,87	21,50	14,03	9,05
Mikra	16.20	18.83	21.22	25.00	30.61	35.08	36.89	35.86	32.42	27.36	21.65	17.47
Edessa	15.17	17.64	20.50	24.12	28.88	33.76	34.27	34.50	30.68	26.72	20.69	16.13
Ptolemaida	14.37	15.94	20.30	24.06	29.15	33.36	34.45	35.04	31.08	26.35	19.45	17.06
Florina	13.33	15.88	21.12	24.28	28.72	32.79	35.28	34.75	31.46	27.10	20.98	15.59
Kastoria	14.93	16.46	21.06	24.28	28.82	33.43	36.12	35.33	31.32	26.97	20.72	15.32

Note: All numbers are in Celsius degrees (°C)

Source: HNMS (2012)

Table 6-31 Average Minimum Temperature

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	1,33	1,77	3,45	7,08	11,36	15,18	17,78	17,70	14,18	10,35	6,62	3,12
Komotini	1,41	2,34	3,90	7,28	11,70	15,25	17,61	17,14	13,54	9,70	6,48	3,20
Xanthi	-0,16	0,23	2,59	6,82	12,03	16,02	18,67	18,22	13,81	9,25	4,85	0,89
Chrysoupoli / Kavala	1,66	1,83	4,29	8,58	13,21	17,08	19,25	18,84	14,98	10,79	6,65	2,96
Serres	-0,11	1,31	3,97	7,83	12,72	16,73	18,71	17,98	14,33	9,76	4,85	0,99
Drama	0,81	1,84	4,56	8,43	13,28	17,38	19,58	19,01	15,34	11,02	6,17	2,23
Mikra	-5.32	-4.43	-2.01	2.37	7.08	12.16	14.73	14.78	9.90	4.39	-1.00	-3.86
Edessa	-5.36	-3.15	-0.45	4.35	8.48	11.73	15.39	15.44	10.91	5.65	0.32	-3.87
Ptolemaida	-9.36	-6.21	-3.46	0.69	3.94	7.64	12.00	11.10	6.58	1.10	-3.00	-6.96
Florina	-12.71	-9.19	-5.40	-0.72	3.87	7.44	9.66	9.67	5.70	0.20	-5.05	-10.48
Kastoria	-9.71	-8.18	-4.76	-1.24	3.54	7.26	10.48	9.83	5.41	0.33	-3.89	-8.76

Note: All numbers are in Celsius degrees (°C)

Source: HNMS (2012)

Table 6-32 Absolute Maximum Temperature

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	17,80	22,40	24,80	27,00	33,40	37,40	39,80	39,80	36,80	32,60	35,00	30,00
Komotini	19,50	23,40	24,80	26,60	32,80	36,00	39,00	39,80	34,80	30,20	23,50	20,20
Xanthi	20,00	23,00	25,60	28,00	33,00	36,20	42,20	40,00	37,80	34,60	25,00	18,00
Chrysoupoli / Kavala	22,00	20,00	23,80	26,00	34,00	34,80	39,00	38,00	34,00	30,20	24,20	20,00
Serres	21,20	24,20	27,00	30,60	36,00	39,40	43,80	42,00	36,60	34,20	26,40	18,60
Drama	18,40	22,80	27,30	29,80	34,40	38,70	41,60	39,80	42,80	34,40	27,40	18,00
Mikra	20.80	23.20	31.60	31.20	36.00	41.40	44.00	40.40	36.20	31.60	26.60	22.60
Edessa	17.80	20.60	26.00	27.50	32.20	37.00	37.60	37.80	33.40	30.80	25.20	21.00
Ptolemaida	18.80	23.40	25.20	29.40	34.00	37.40	37.40	37.40	34.00	31.20	25.00	20.00
Florina	18.00	23.00	27.60	31.20	33.80	39.00	40.80	39.20	36.00	32.20	26.60	21.00
Kastoria	22.00	26.00	27.60	31.20	33.40	38.00	41.60	39.00	34.20	31.40	24.60	21.60

Note: All numbers are in Celsius degrees (°C)

Source: HNMS (2012)

Table 6-33 Absolute Minimum Temperature

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupoli	-13,20	-14,00	-8,20	-3,00	1,00	6,60	9,00	6,50	2,00	-2,00	-9,30	-13,50
Komotini	-16,90	-10,20	-6,50	-2,30	3,10	5,30	9,40	8,00	4,20	-1,30	-5,00	-8,40
Xanthi	-12,00	-12,00	-12,00	-8,00	-0,00	5,00	7,00	8,20	4,00	-4,00	-10,00	-9,00
Chrysoupoli / Kavala	-8,00	-11,00	-3,60	-4,20	4,00	8,20	11,20	11,00	8,20	-1,00	-4,20	-8,80
Serres	-17,60	-12,60	-6,80	-5,40	4,60	7,60	11,40	10,60	1,80	-4,80	-6,80	-18,00
Drama	-13,80	-13,00	-8,80	-4,00	4,00	9,00	11,00	10,00	1,70	-2,80	-4,00	-15,00
Mikra	-14.00	-12.80	-33.20	-1.60	3.00	6.80	9.60	8.20	2.60	-1.40	-6.20	-9.80
Edessa	-9.00	-6.80	-4.00	1.00	6.20	2.00	13.60	13.00	5.20	2.00	-4.20	-6.00
Ptolemaida	-20.00	-14.80	-7.60	-2.60	1.20	5.20	9.00	8.00	1.40	-4.00	-8.00	-17.00
Florina	-21.40	-19.00	-13.60	-10.60	0.00	2.40	6.20	4.00	0.20	-5.00	-12.60	-21.00
Kastoria	-22.40	-15.80	-11.90	-14.00	0.40	4.40	8.40	3.60	2.20	-5.50	-9.60	-22.80

Note: All numbers are in Celsius degrees (°C)

Source: HNMS (2012)

6.2.6.2.3 Humidity

Relative humidity (%) data measured in Meteorological Stations of Alexandroupoli, Komotini, Xanthi, Chrysoupoli, Serres, Drama, Mikra, Edessa, Ptolemaida, Florina and Kastoria are presented in *Table 6-34*. As it is obvious by these data the relative humidity values (%) are similar among the different Stations and they are gradually reduced during spring and summer and gradually increased during autumn and winter. The highest values of relative humidity generally appear during December (66.25%- 81.52%) and the lowest during July (46.08%-55.23%).

Table 6-34 Relative Humidity

Station/area	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Alexandroupol	76,1	73,9	72,5	70,8	67,8	60,1	53,9	53,9	60,1	68,3	75.6	77,2
Komotini	73,0	72,2	70,3	69,9	67,1	58,3	52,4	51,3	58,9	67,9	75,3	75,8
Xanthi	72,8	72,6	72,6	73,1	70,4	65,4	61,1	62,5	67,3	71,1	74,8	73,8
Chrysoupoli / Kavala	75,0	72,5	71,9	71,8	66,8	62,4	57,9	59,5	65,4	70,5	75,7	75,5
Serres	78,5	71,9	67,5	63,6	60,6	54,6	52,0	55,0	60,6	70,2	76,9	81,2
Drama	77,6	71,4	67,1	62,8	60,0	54,9	52,3	54,8	59,5	68,5	76,1	79,9
Mikra	76.12	72.33	71.36	67.54	63.51	55.43	52.82	55.20	62.05	70.30	76.42	78.04
Edessa	72.02	71.76	65.79	63.43	61.83	55.15	52.15	55.52	60.75	68.91	73.10	72.19
Ptolemaida	66.53	65.28	61.69	57.57	55.81	49.50	46.08	47.71	53.13	60.15	64.61	66.25
Florina	81.18	76.40	68.87	62.92	62.88	58.47	55.23	56.81	63.63	71.38	77.98	81.52
Kastoria	78.76	73.64	66.65	63.26	63.41	54.31	49.94	52.85	61.03	70.18	77.84	81.16

Note: All numbers are in %

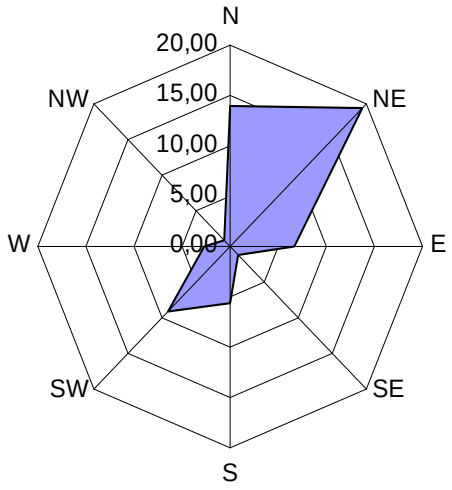
Source: HNMS (2012)

6.2.6.2.4 Wind

The area of Alexandroupoli predominantly experiences calm wind conditions (40.3%), while the prevailing wind direction is north-east for about 19.4% of the time, with intensity equal or less than 4 Beaufort for about 54% of the time. Additionally, in area of Komotini, calm wind conditions appear in 13% of the time, while the north is the prevailing wind for about 22.9% of the time, with intensity equal or less than 4 Beaufort for more than 79% of the time. The area of Xanthi predominantly experiences calm wind conditions (55.5%), while the prevailing wind direction is north for about (41.6%) of the time, with intensity equal or less than 3 Beaufort for about 41.6% of the time. In the area of Chrysoupoli (Kavala) calm wind conditions appear in 37,7% of the time, while the wind directions vary between northeast and east directions (13.4% - 18.8%), with intensity less or equal to 4 Beaufort for more than 60,7% of the time. In the area of Serres wind calm conditions definitely prevail (62%), while the dominant wind directions are mainly south (9.4%) and less frequently north (5%), east (5.7%), west (5.6 %), north west (5%), with intensity less or equal to 4 Beaufort for about 35% of the time. In the area of Drama wind calm conditions definitely prevail (77%), while the north is prevailing wind for about (14.2%) of the time, with intensity equal or less than 3 Beaufort for about 22.6% of the time.

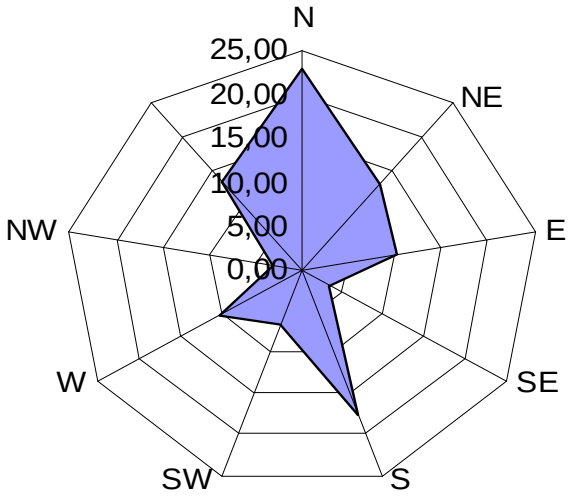
The area of Mikra (Axios Plain section) predominantly experiences calm wind conditions (33.0%), while the prevailing wind direction is northwest for about 11.8% of the time, with intensity equal or less than 4 Beaufort for about 60% of the time. Additionally, in area of Edessa (Vermio Mountain slopes section), calm wind conditions appear in 60% of the time, while the northerly is the prevailing wind for about 18.2% of the time, with intensity equal or less than 4 Beaufort for more than 39% of the time. In the area of Ptolemaida (Ptolemaida Basin section), wind calm conditions are rarely observed, while the dominant wind directions are mainly northwest (33%) and west (27%) and less frequently southwest (12%), east (12%), northeast (8%) and southeast (9%) with intensity less or equal to 3 Beaufort for about 98% of the time. In the area of Florina (Askion Mountain slopes section) wind calm conditions definitely prevail (66%), while the wind directions vary between southwest to east directions (4%-7%), with intensity less or equal to 4 Beaufort for more than 32% of the time. Finally, in the area of Kastoria (Kastoria-to-border section), the calm conditions are once again the dominant conditions (56%), while the dominant wind directions vary between southeast to northeast (4%-10%), with intensity equal or less than 4 Beaufort for more than 39% of the time.

Figure 6-25 Distribution of Wind Direction in Alexandroupoli (%).



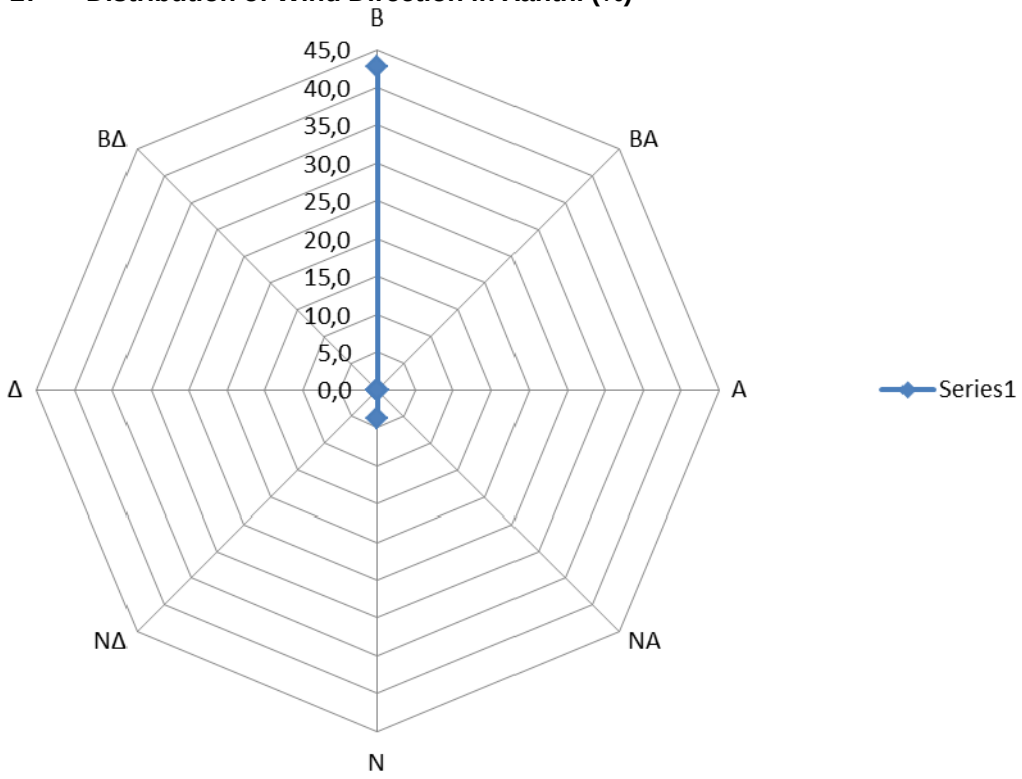
Source: ASPROFOS (2013), HNMS (2012a)

Figure 6-26 Distribution of Wind Direction in Komotini (%)



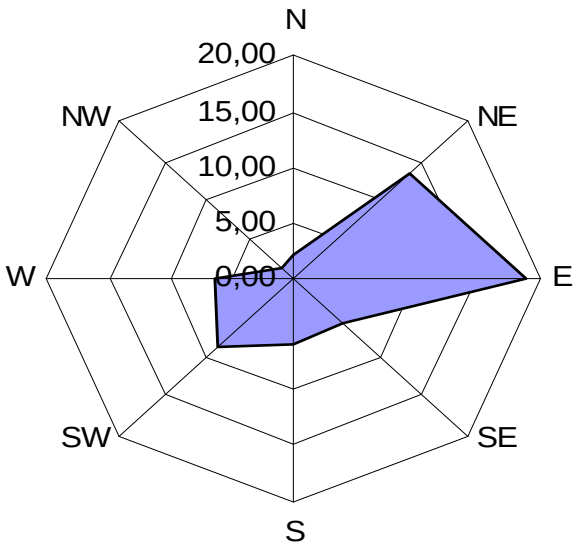
Source: ASPROFOS, 2013, HNMS (2012a)

Figure 6-27 Distribution of Wind Direction in Xanthi (%)



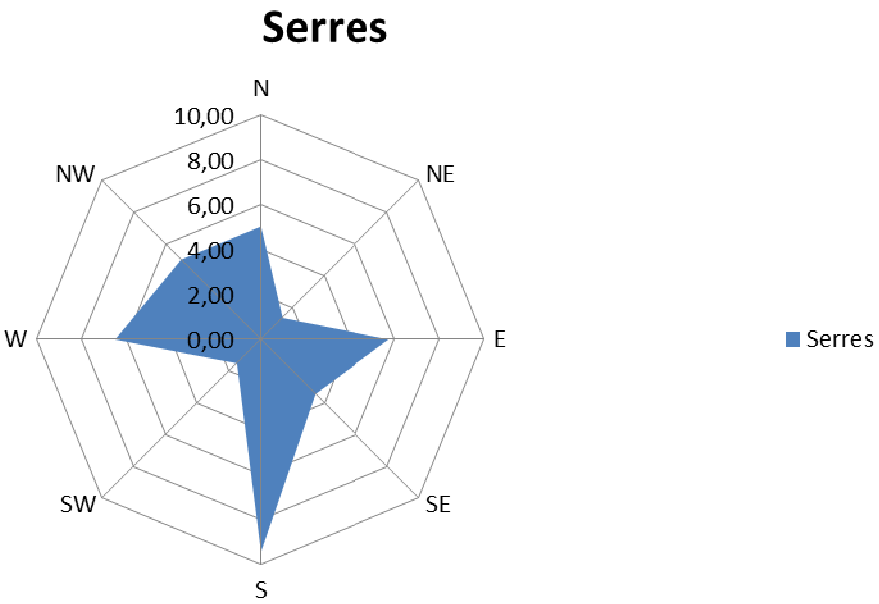
Source: ASPROFOS, 2013, HNMS (2012a)

Figure 6-28 Distribution of Wind Dierection in Chrysoupoli Kavala (%)



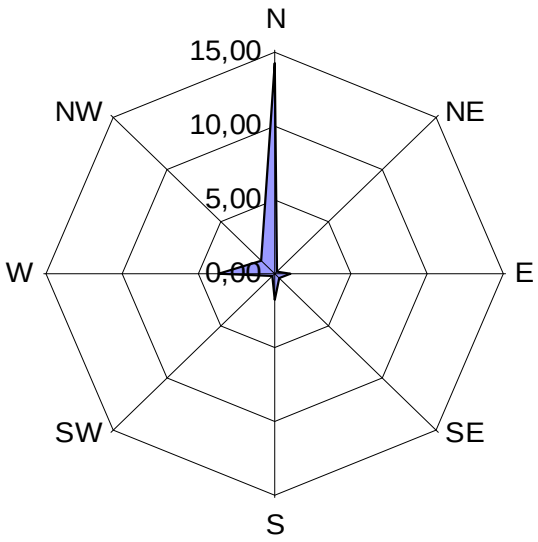
Source: ASPROFOS, 2013, HNMS (2012a)

Figure 6-29 Distribution of Wind Dierection in Serres (%)



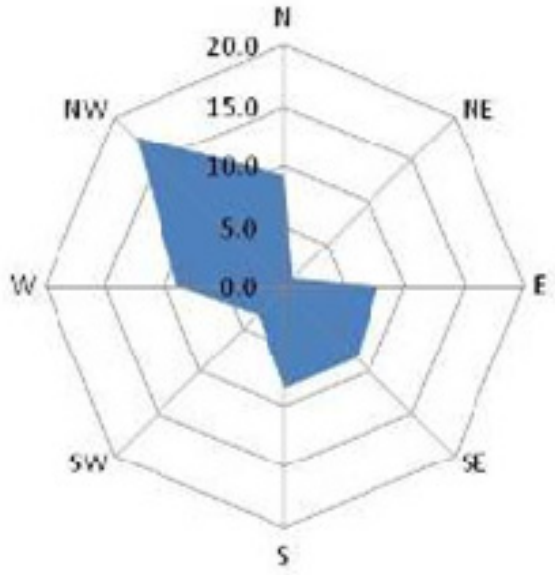
Source: ASPROFOS, 2013, HNMS (2012a)

Figure 6-30 Distribution of Wind Direction in Drama (%)



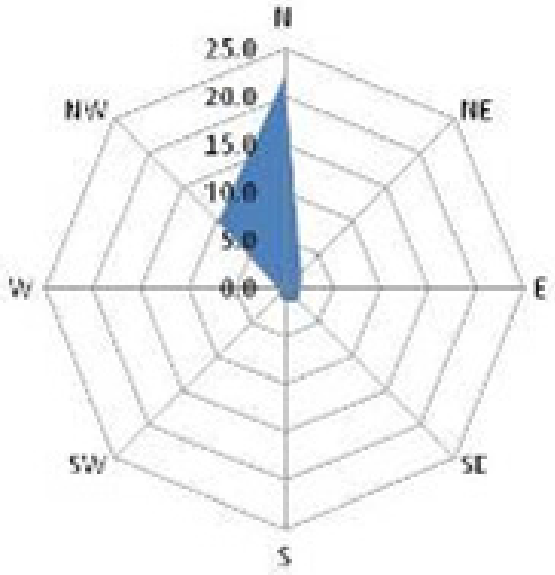
Source: ASPROFOS, 2013, HNMS (2012a)

Figure 6-31 Distribution of Wind Directions in Mikra (%)



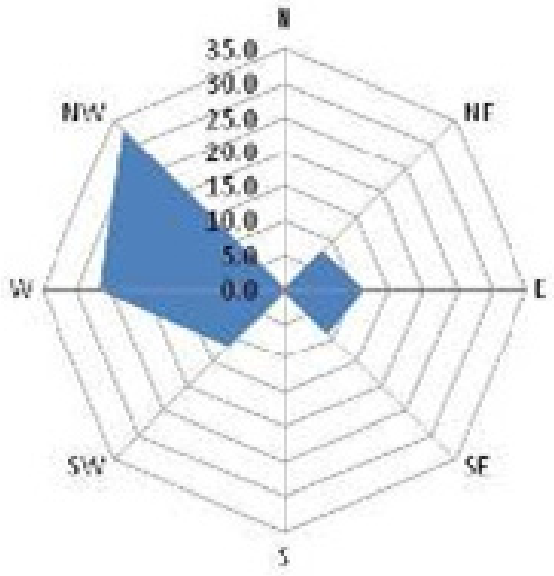
Source: HNMS (2012a)

Figure 6-32 Distribution of Wind Directions in Edessa (%)



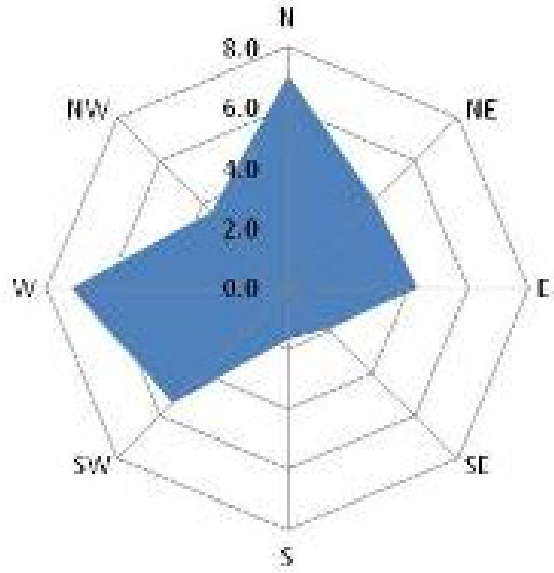
Source: HNMS (2012a)

Figure 6-33 Distribution of Wind Directions in Ptolemaida (%)



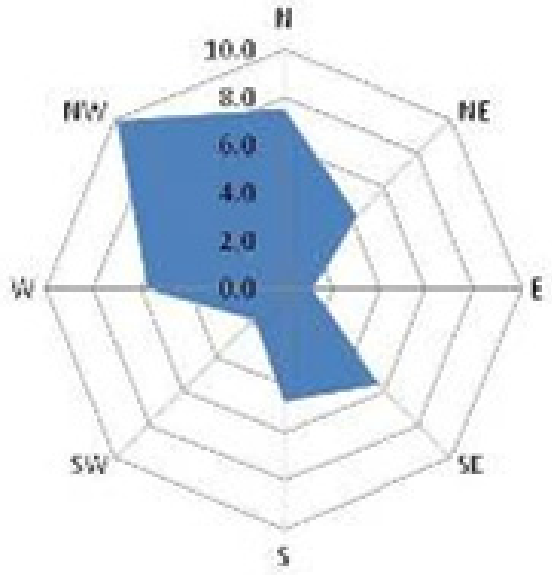
Source: HNMS (2012a)

Figure 6-34 Distribution of Wind Directions in Florina (%)



Source: HNMS (2012a)

Figure 6-35 Distribution of Wind Directions in Kastoria (%)



Source: HNMS (2012a)

6.2.6.3 Ambient Air Quality

Existing air quality conditions along the proposed TAP route have been identified using the European Environmental Agency (EEA) Air Quality Database (AirBase) to which Greece is reporting. AirBase data is publicly available from the official EEA AirBase website[13]. The air quality baseline focused on the macro pollutants considered in this study, NO_x and SO_2.

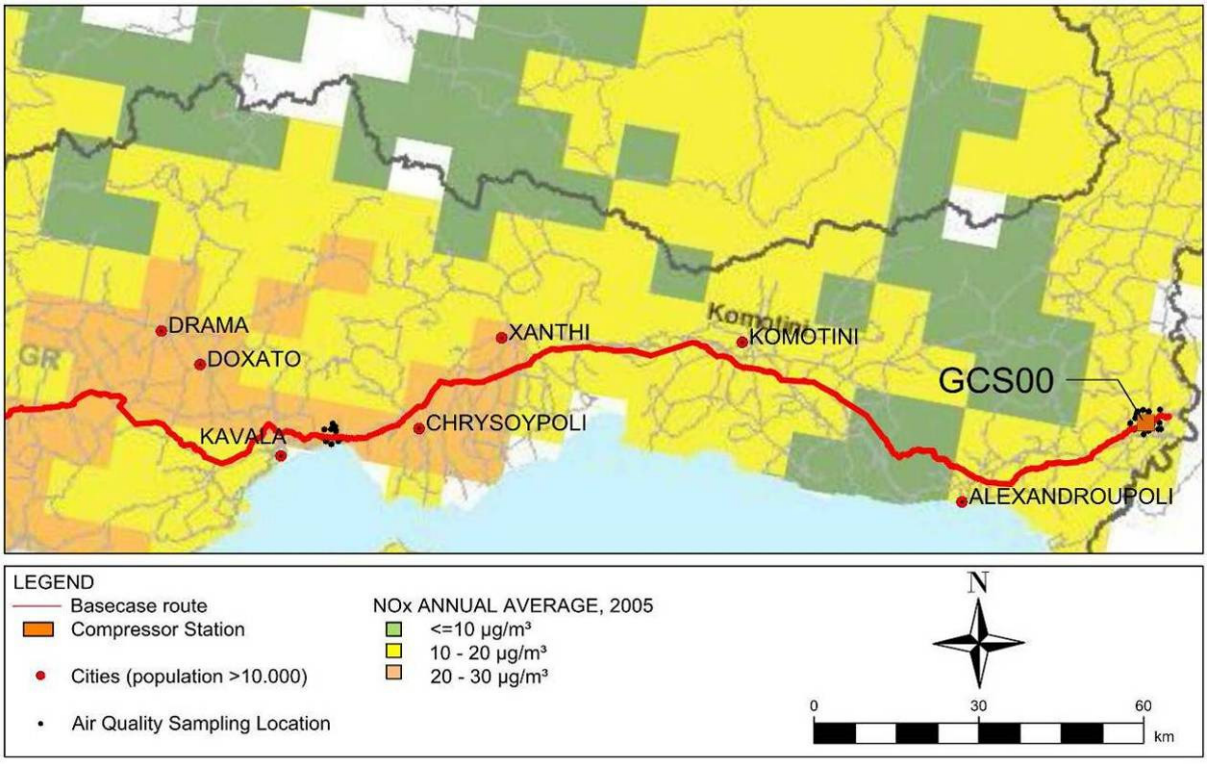
Data available from the EEA AirBase website includes interpolated maps of atmospheric macro pollutants over Europe. NO_x and SO_2 annual average maps are available for the years 2004 and 2005[14].

A subset of the EEA NO_x annual average - 2005 map, for the Section (KP 0.0 – KP 359) in Greece is presented *in Figure 6-36* to *Figure 6-37.* As shown in *Figure 6-36* to *Figure 6-37* , the 2005 interpolated NO_x annual average values are in the range of 0 – 30 mg/m^3. Specifically in the east from the border to Xanthi the values are between 10 – 20 mg/m^3 with an area NW of Alexandroupoli with values below 10 mg/m^3 and from Xanthi to Nea Mesimvria values are mainly 20 – 30 mg/m^3 with some areas with 10 – 20 mg/m^3

[13] http://www.eea.europa.eu/themes/air/airbase
[14] http://www.eea.europa.eu/themes/air/airbase/interpolated

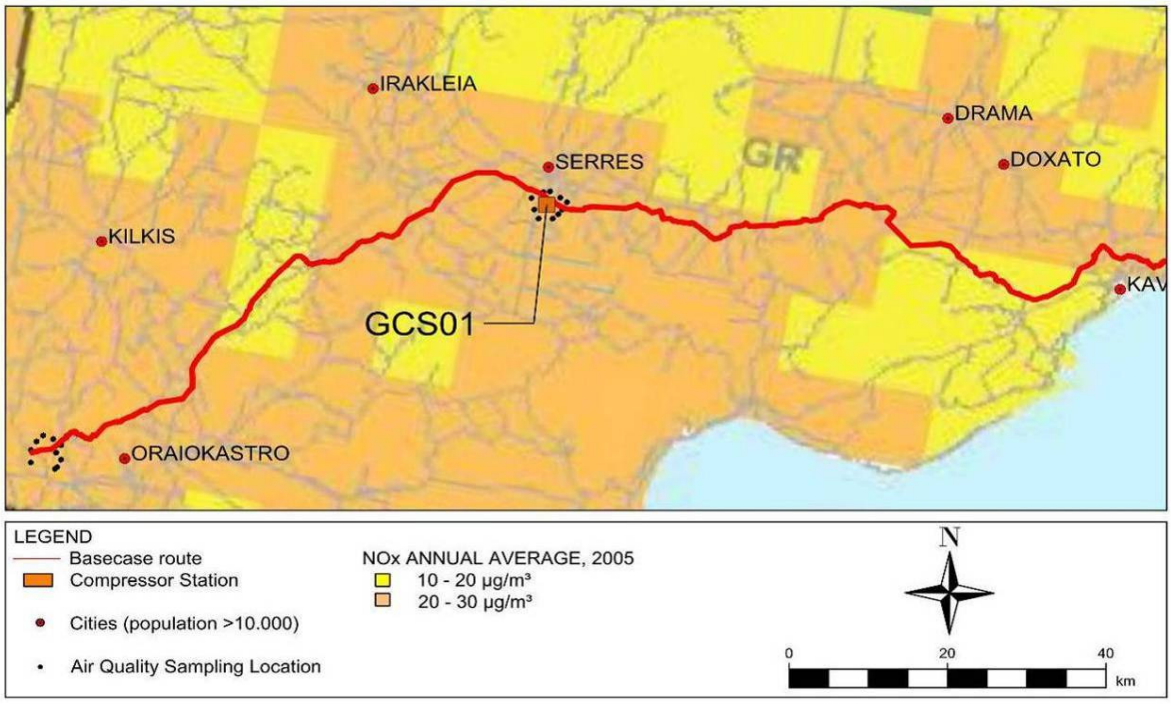
A subset of the EEA NO_x annual average 2005 map for the Section KP 359 – KP 543 is presented in *Figure 6-38*.. As shown in *Figure 6-3640* the 2005 interpolated NO_x annual average values are in the range of 20 – 30 mg/m^3 in the Axios Plain Section and between 10 and 20 mg/m^3 in the Greek Albanian border area.

Figure 6-36 NOx Annual Average Background Concentration (From Alexandroupoli to Kavala)



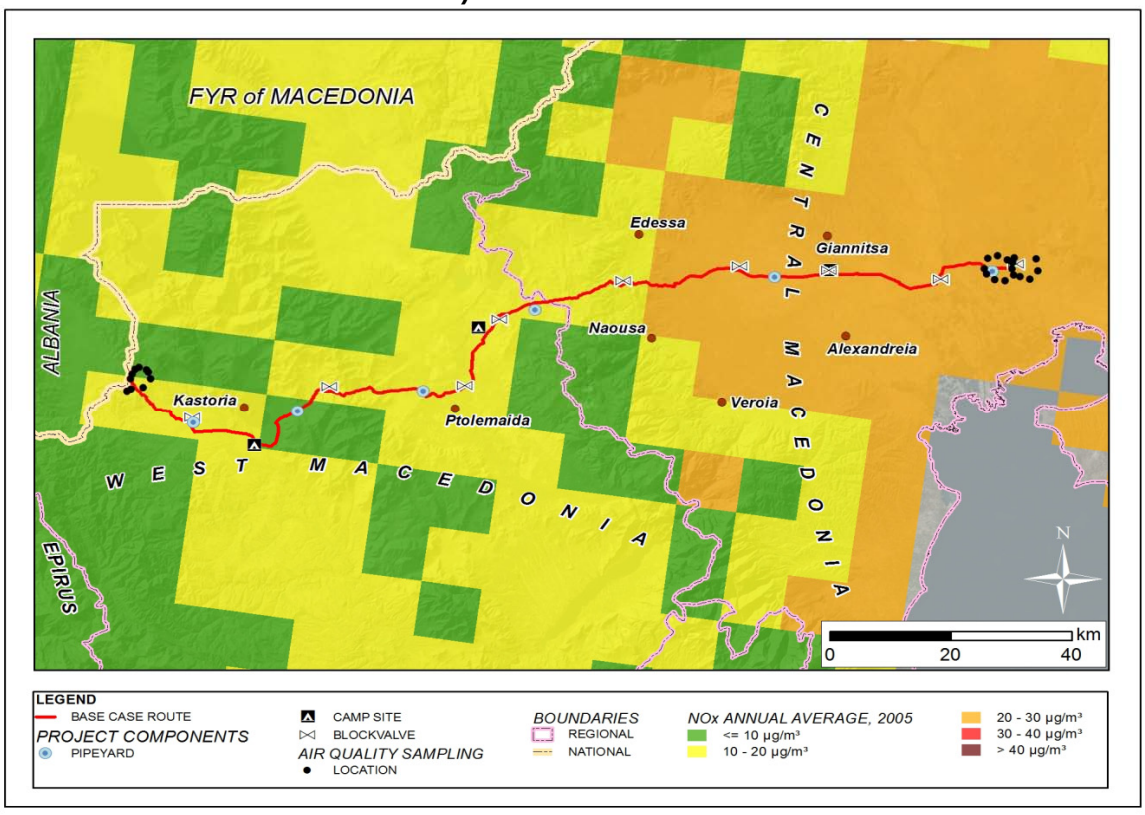
Source: EEA Interpolation Dataset (2005)

Figure 6-37 NOx Annual Average Background Concentration (From Kavala to Thessaloniki)



Source: EEA Interpolation Dataset (2005)

Figure 6-38 NO_x Annual Average Background Concentration (From Thessaloniki to Greek/Albanian Border)

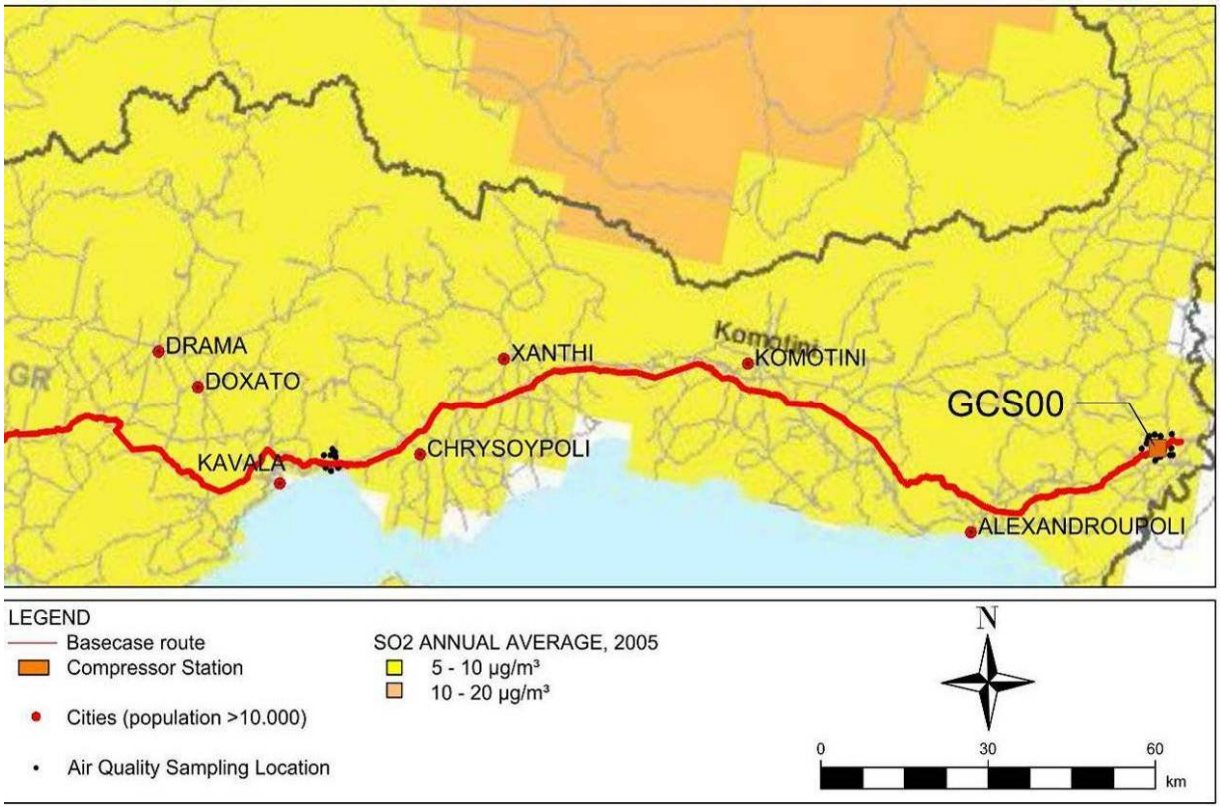


Source: EEA Interpolation Dataset (2005)

A subset of the EEA SO_2 annual average 2005 map for the Section KP 0.0 – KP 359 is presented in *Figure 6-39* to *Figure 6-40* and for Section KP 359 – KP 543 in *Figure 6-41.*

As shown in *Figure 6-39* to *Figure 6-41* the 2005 interpolated SO_2 annual average values are in range 5 – 10 mg/m^3.

Figure 6-39 SO_2 Annual Average Background Concentration (From Alexandroupoli to Kavala).



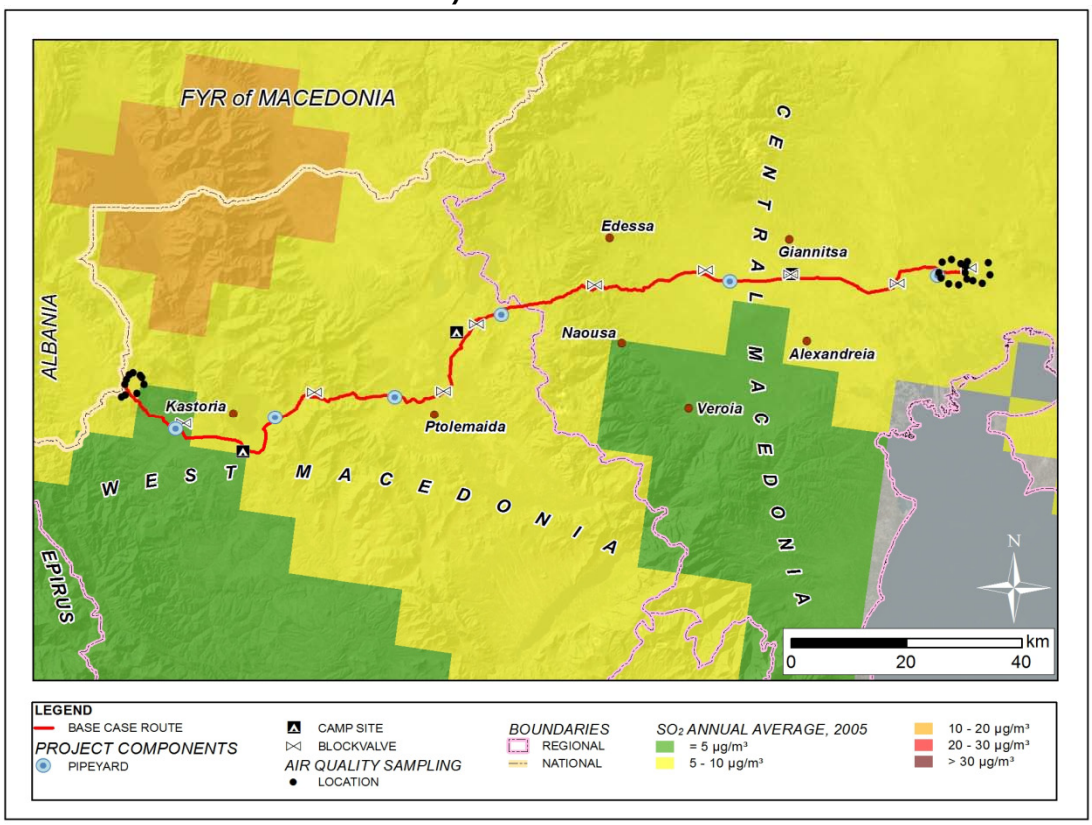
Source: EEA Interpolation Dataset (2005)

Figure 6-40 SO_2 Annual Average Background Concentration (From Kavala to Thessaloniki).



Source: EEA Interpolation Dataset (2005)

Figure 6-41 SO_2 Annual Average Background Concentration (From Thessaloniki to Greek/Albanian Border)

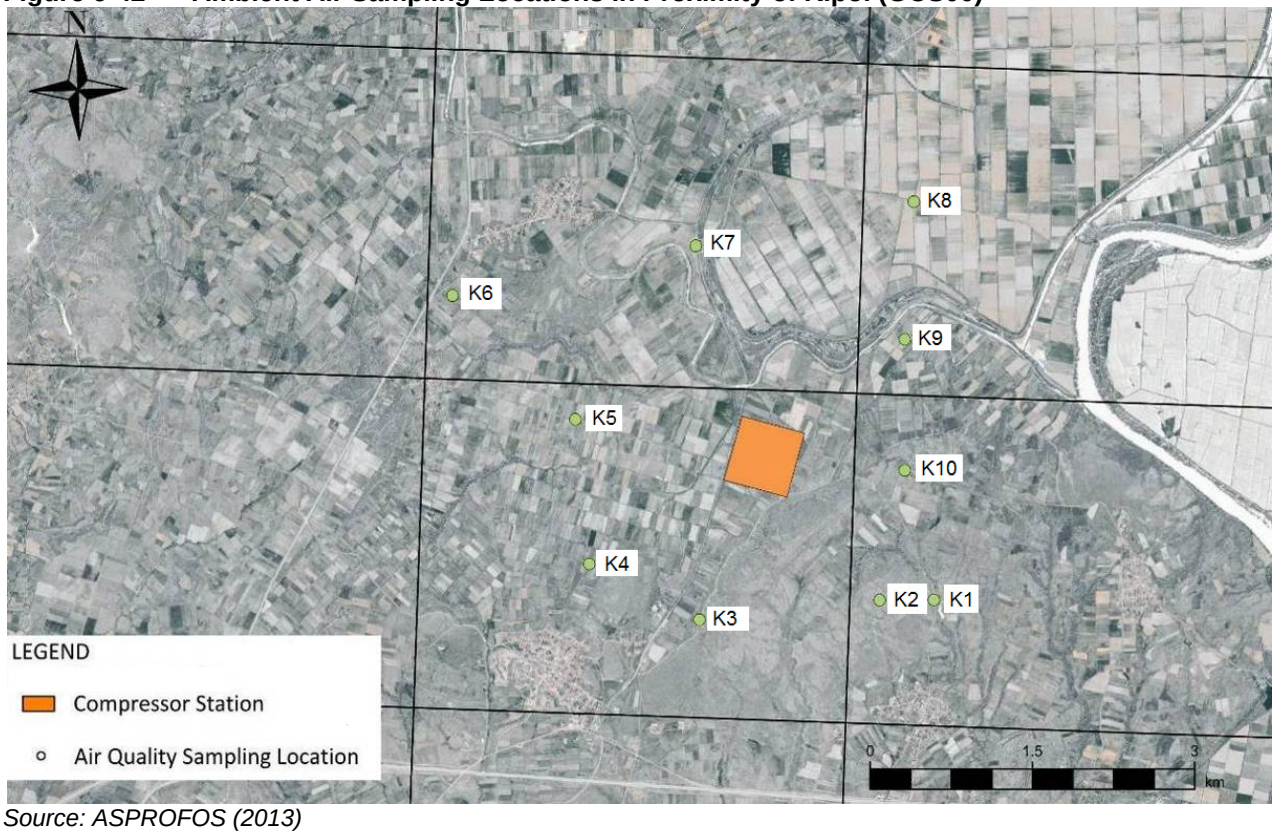


Source: EEA Interpolation Dataset (2005)

Air quality sampling took place in Kipoi, and Serres. The results are presented from

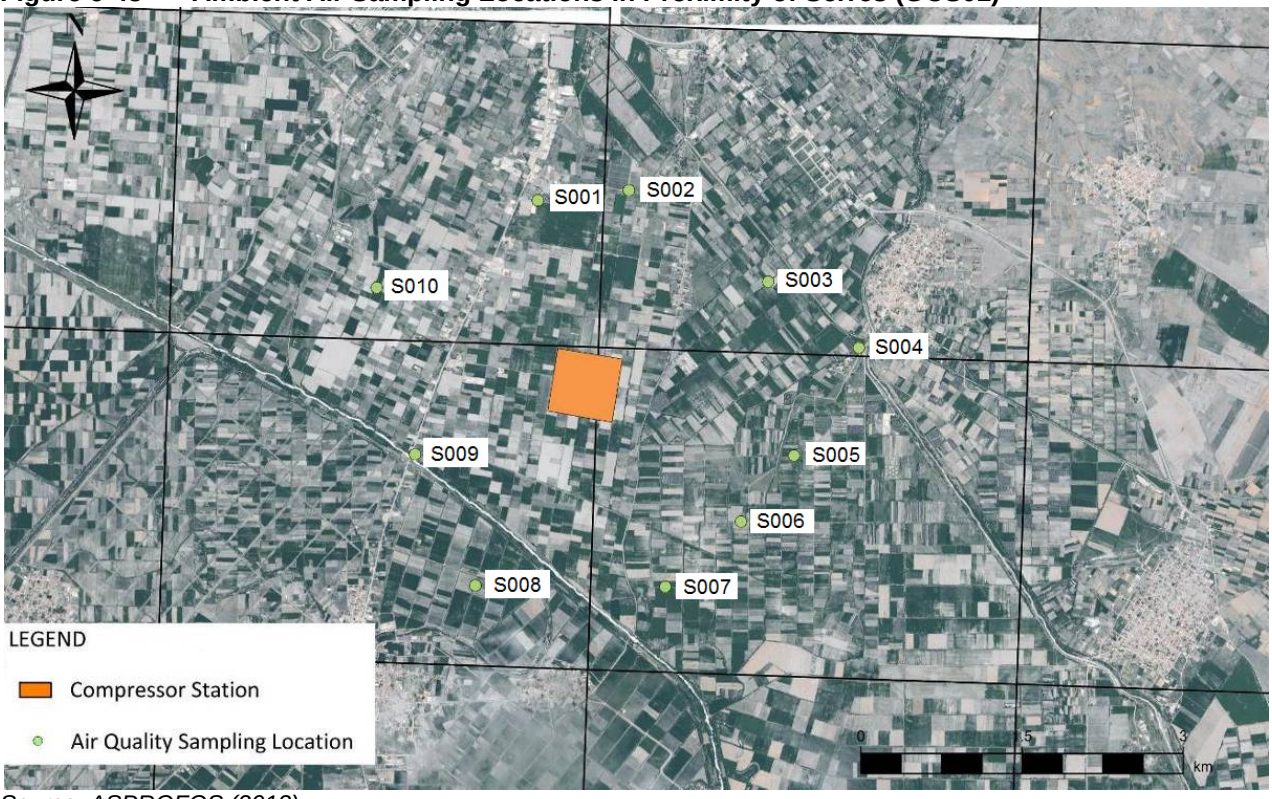
Table 6-35 till *Table 6-36* and the detailed methodology used is given in *Annex 6.6.5.* The locations of the air quality sampling survey undertaken in November / December 2012 are shown from *Figure 6-42* till *Figure 6-43* The sampling locations focused on the proposed and alternatives sites of the investigated compressor stations that were being considered as part of the Project design at the time of surveying. As a result of the subsequent route refinement and ongoing design process the TAP Project in Greece now includes only two compressor station located near the Turkish border - GCS00, in the proximity of Kipoi and GCS01 in the proximity of Serres.

Figure 6-42 Ambient Air Sampling Locations in Proximity of Kipoi (GCS00)



Source: ASPROFOS (2013)

Figure 6-43 Ambient Air Sampling Locations in Proximity of Serres (GCS01)



Source: ASPROFOS (2013)

Table 6-35 Analytical Results of Air Sampling at Kipoi

Sampling point code	*X (UTM84/34N)*	*Y (UTM84/34N)*	*X (GGRS87)*	*Y (GGRS87)*	*SO_2*	*NO_2*
					µg/m^3	**µg/m^3**
K1	946780	4548146	694099	4536837	**2.9**	**6.10**
K2	946276	4548126	693596	4536835	**4.3**	**8.00**
K3	944615	4547891	691932	4536657	**4.3**	**8.40**
K4	943578	4548363	690914	4537164	**3.0**	**7.60**
K5	943405	4549674	690786	4538478	**3.0**	**7.10**
K6	942229	4550760	689651	4539601	**5.3**	**11.7**
K7	944465	4551291	691899	4540053	**3.8**	**8.50**
K8	946468	4551761	693913	4540453	**3.5**	**7.80**
K9	946427	4550506	693830	4539203	**4.2**	**6.30**
K10	946468	4549315	693830	4538014	**4.6**	**5.30**

Compiled by ASPROFOS, EXERGIA, DIMOKRITOS (2013)

At Kipoi area the average values (during the sampling period) were 3,9±0,9 µg/m^3 for SO_2 and 7,5±2,5 µg/m^3 for NO_2.

Table 6-36 Analytical Results of Air Sampling at Serres.

Sampling point code	*X (UTM84/34N)*	*Y (UTM84/34N)*	*X (GGRS87)*	*Y (GGRS87)*	*SO_2*	*NO_2*
					µg/m^3	**µg/m^3**
S001	713387	4548345	461146	4545054	**1.2**	**19.2**
S002	714231	4548468	461993	4545148	**1.3**	**18.6**
S003	715555	4547662	463288	4544297	**0.9**	**14.8**
S004	716420	4547078	464132	4543684	**0.5**	**13.8**
S005	715851	4546055	463529	4542682	**0.8**	**11.5**
S006	715380	4545423	463036	4542067	**1.0**	**11.0**
S007	714695	4544794	462331	4541462	**0.6**	**10.0**
S008	712927	4544744	460563	4541473	**0.4**	**13.8**
S009	712325	4545945	460003	4542693	**1.4**	**19.3**
S010	711914	4547484	459645	4544244	**1.3**	**18.7**

Compiled by ASPROFOS, EXERGIA, DIMOKRITOS (2013)

At Serres area, the average values (during the sampling period) were 0.9 ± 0.2 µg/m^{3}for SO_2 and 15,1 ± 5,1 µg/m^3 for NO_x.

The levels. of NO_x pollutants are considerably lower in Kipoi areas from Serres, while the levels of SO_2 pollutant are lower in Serres than Kipoi.

In general the levels of both pollutants are low at both proposed areas for GCSs (Kipoi and Serres). This is likely to be result from the absence of strong sources of pollution (intense vehicle circulation, anthropogenic activities, industries etc) in the local areas. The air quality in the areas of Kipoi and Serres is considered to be good.

6.2.7 Acoustic Environment

Three (3) sensitive receptors were identified near each of the Compressor Station site. The sites were selected since the compressor stations pose the permanent noise source of the project. Project's temporary facilities, such as pipeyard sites and construction camps, are located in sites with typical noise for rural areas neighboring roads with low traffic flows and was not deemed necessary to perform noise measurements there.

The acoustic environment at the measured locations predominantly consisted of ambient noise from any nearby roads and natural sounds, such as the wind, dogs' barkings, bird songs and other animal sounds.

Regarding GCS00 near the Greek/ Turkish borders, nigth time measurements and a spot measurement were performed at a site near Peplos (see *Figure 6-44*). Regarding GCS01, at the broader area of Serres, nigth time measurements were performed at a site near Konstantinato and a spot measurement was performed at a site near Krinos (see *Figure 6-45*).

Further information on the field survey methodology and the spectral statistical descriptors for the different sampling locations are presented in *Annex 6.6.6.*

Figure 6-44 Noise sampling locations for GCS00 near Kipoi



Source: Genest und Partner Ingenieurgesellschaft mbH (2013)

Table 6-37 Sensitive receptors near GCS00 and noise baseline measurements

Sensitive receptor point	*Distance / Direction to GCS00*
1 Thymaria nearest outskirt of village	approx. 2,000 m north-north-west
2 Tavri nearest outskirt of village	approx. 1,750 m west
3 Peplos nearest outskirt of village	approx. 1,250 m south-south-east

Source: Genest und Partner Ingenieurgesellschaft mbH (2013)

Figure 6-45 Noise sampling locations for GCS01 near Serres



Source: Genest und Partner Ingenieurgesellschaft mbH (2013)

Table 6-38 Noise sensitive receptors near GCS01

Sensitive receptor point	*Distance / Direction to GCS01*
1 Krinos nearest outskirt of village	approx. 1950 m
2 Konstantinato nearest outskirt of village	approx. 2050 m
3 Neochori nearest outskirt of village	approx. 2350 m

Source: Genest und Partner Ingenieurgesellschaft mbH (2013)

The average background (LA90) noise levels at the measured locations are given in *Table 6-39*. Full results for all sampling locations are provided in *Annex 6.6.6*.

Table 6-39 Measured Noise Levels (dB(A))

Sampling site no.	*Location*	*LAeq*
Site south of Peplos see Figure 6-44)	GCS00 (average of night-time hourly measurments)	38.81
Site at Peplos	GCS00 (spot measurment at Kipoi)	36.6
Site north of Konstantinato see Figure **6-45**	GCS01 (average of night-time hourly measurments)	36.47
Site south of Krinos see Figure **6-45**	GCS01 (spot measurment at Krinos)	28.2
Note: According to National Legislation, night time noise limits is 45 dB(A).		

Source: Genest und Partner Ingenieurgesellschaft mbH (2013)

Ambient noise levels measured at GCS00 and GCS01 are low, as illustrated from the night time hourly measurements. Nevertheless, the sites are located at least 1.5 km from any residential areas – i.e. sensitive receptors.

6.2.8 Landscape and Visual Amenity

6.2.8.1 Introduction

As described in *Annex 6.6.4* landscape and visual analysis has been conducted for the project located in Greece running across the Regions of Eastern Macedonia and Thrace, Central Macedonia and Western Macedonia, for approximately 543 km. The analysis has been conducted in order to establish the landscape conditions and quality before the beginning of the works and to enable a correct assessment of the short and long term impacts due to the

construction of the project, its operation and its future decommissioning regarding the landscape of the study area.

The key steps in the methodology applied to the assessment are as follows:

- Establish landscape and visual study area
- Prepare a baseline landscape character assessment of the study area and define sensitivity of the local landscape character to the proposed changes due to project; and
- Prepare baseline description of visual amenity from key viewpoint locations and define the sensitivity of the viewers at given viewpoint locations to the proposed changes by the project.

6.2.8.2 Landscape Character Types

Landscape Character Types were identified and described in the study area along the pipeline route based on desktop work and the field surveys (further details are presented in *Annex 6.6.4*). The pre-classification of landscape types from topographic maps and satellite was confirmed and refined in the field. A total of 289 field locations were used during the Landscape Field Survey undertaken in July 2011 and between August 2012 and February 2013. The complete list of the locations is provided in *Annex 6.6.4*.

Based on the above, eighteen (18) distinct Landscape Character Types were identified:

- *Plain agricultural areas:* This landscape unit covers most of the study area. It is present along the sections of River Evros, Lowlands of Evros, Komotini – Xanthi Plain, Philippoi Plain, Serres Plain, Gallikos Plain and Axios Plain. The river systems of Evros, Filouris, Bosbos (aka Bosbozis), Kompsatos (aka Xiropotamos), Xanthis (aka Kosinthos), Aggitis, Nestos, and Stimonas, along with numerous irrigation channels, such as Philippoi Ditch or Mpelitsa Ditch, are dominant and have contributed to the fertility of the land. Along the rivers, the riparian vegetation present is mainly consisted of hedges and low vegetation. Only along Bosbos, Xanthis and Nestos (and partially Strymonas), is the landscape modified. The agricultural fields can be divided into irrigated and non-irrigated. The landscape offers open views of fields spreading unified in the entire area and it is only

interrupted by small villages that are embedded smoothly in the landscape. Amaranta, Peplos, Iasmos, Amaxades, Diomidia, Chrysioupoli, Symvoli, Nea Zichni, Tholos, Gazoros, Neos Skopos, Mitrousi, and Provatas are included in the most important residential areas in this landscape type.

- *Mountainous forested areas:* Areas of this type are present, mainly, in the sections of Southern Evros, Kavala mountains, Kroussia mountains, Vermio Mountain, Askio Mountain and Kastoria-to-border. It also forms the northern borders of Komotini – Xanthi Plain section. They include protected areas such as the Wildlife Refuges of (i) Kirki, (ii) Agios Timotheos – Kioupia, (iii) Nestos' Straits, (iv) Kastene Ntag, and (v) 'Er. Makryotissa–Ampelia-Nisi-Riziana. There are Natura 2000 sites such as (i) Southern Forest Complex of Evros (GR1110009), (ii) Kompsatos River Valley (GR1130012), (iii) Nestos' Straits (GR1120004),. There are also the Aesthetic Forests of (i) Kavala-Amygdaleona and (ii) Nestos. The altitude of these areas ranges from 300 metres to 1900 metres a.s.l. with moderate to high inclinations and steep slopes. The landscape offers inspiring views to colourful and beautiful pure or mixed forests and an overview of the agricultural plains. They are mostly covered by Quercus and Pinus sp high forests, mixed with Caprinus, Fraxinus and Acer sp and woodlands (shrublands) and beeches *(Fagus sylvatica)*. They are important sites for breeding and wintering of avifauna and other fauna species associated with forest. AnoGrammatiko, Kato Grammatiko, Kleisoura and Lehovo are some of the most important traditional villages that are smoothly embedded into the whole scenery.

- *Mixed forested and agricultural areas*: This landscape type is present in Southern Evros, the eastern limits of Kavala mountains, Serres Plain, and Gallikos Plain sections. This landscape type covers most of the Kroussia mountain section. It is characterised by areas mixed with agricultural fields and forests before entering the pure forests. Scrub or herbaceous vegetation, broad-leaved forested areas and non-irrigated arable lands are the dominant land cover of this landscape type. The altitude is rather low reaching up to 500 metres a.s.l.

- *Mixed agricultural and urban or industrial areas*: This landscape unit combines landscape characteristics of plain agricultural areas and artificial surfaces and covers transitional areas between the two previously mentioned landscapes. The agricultural character of the landscape, offering open view of fields, is interrupted by limited artificial developments of discontinuous residential areas or industrial/ commercial developments. It is present near

significant urban centres of the area, mainly close to Komotini, Xanthi and Nea Karvali, in the Komotini-Xanthi Plain section, and at the western limits of the Kavala mountain section and of course north of Thessaloniki, in Gallikos plain section.

- *Hilly shrublands and grasslands*: Areas of this type are present, mainly, in the area of Evros Regional Entity. Scrub and/or herbaceous vegetation are dominant and also natural vegetation. The altitude of these areas is low (ranging from 100 to 600 metres a.s.l.) forming hills covered with shrublands. This type usually stands for a transitional landscape before entering the natural forests. The scrubs and/or herbaceous vegetation are dominant here along with woodland.

- *Hilly mixed grasslands and agricultural areas:* This landscape type is mainly present in the Kroussia mountain section and constitutes a transitional zone between the agricultural areas in the Gallikos plain and Kroussia Mountain foothills. The altitude of this area varies from 100 to 600 metres a.s.l. and it is mostly covered by agricultural lands interrupted by grasslands and shrubs.

- *Urban and industrial areas:* This landscape type is present in Southern Evros area, in Komotini-Xanthi plain, Kavala mountains, Serres plain, Gallikos plain, Axios plain and Ptolemaida basin. It is mainly represented by the cities of Alexandroupolis, Komotini, Kavala, Serres, Agios Athanasios, Nea Mesimvria, Achialos, and Ptolemaida. These areas apply the most dominant urban characteristics. The industrial area of Komotini close to Thrylorio and Fylakas villages and some quarry development west of Assiros should also be highlighted as they dominate the landscape. It should be highlighted that numerous settlements exist along the study area but their landscape characteristics blend with the dominant agricultural feature of the broader area. In the Ptolemaida Basin, Ptolemaida city and the mineral extraction sites northwest of Perdika village mostly characterise this type of landscape that could be easily be defined as an «*energy* landscape type» since lignite extractionsand the broader industrial area of the power station are the main activities in this landscape type.

- *Mixed riparian forested and agricultural areas*: Areas of this type are present mainly in the Komotini-Xanthi Plain and Serres Plain sections. In the first section, they are connected to the river systems of Bosbos, Xanthis, Kompsatos and Nestos, whilst in the second to the Gazoros torrent, Aggitis River and Strymonas River. The rivers are surrounded by mixed riparian forests (mostly galleries of poplars, willows, and some planes and deciduous

shrublands) and agricultural vegetation. The water element, although limited in width, is dominant in the area and characterizes the whole scenery offering a beautiful and peaceful view to the visitor. It is highlighted that this is not the case for the whole length of the river systems of the study area, due to intensive agricultural development. Areas of this type are also present in the Askio Mountain and Ptolemaida basin sections and they are connected to the Cheimaditida and Zazari lakes system. The lakes are surrounded by mixed riparian forests (mostly oaks and deciduous shrublands) and agricultural vegetation. The lakes are dominant in the area and characterize the whole scenery offering a beautiful and peaceful view to the visitor.

- *Evros wetland*: Evros wetland is present in Evros River area section and includes the river system and the Delta of Evros River. Riparian vegetation is present in the broader area together with the agricultural areas. The area of Delta is very important site for breeding, passage and wintering of waterbirds, raptors and passerines and is also designated as a National Park, Natura 2000 site (GR1110006) and Ramsar Site.

- *Riparian forested areas:* This landscape unit can be observed along Nestos River, in the Komotini-Xanthi plain section. Nestos River is included in the designated Area of High Landscape Value (AHLV) of 'Nestos' Straits' (also Natura2000 site GR1120004 and G1120005, Wildlife Refuge, Aesthetic Forest) and the National Park of Eastern Macedonia – Thrace (also Natura 2000 site GR1150010 and G1150001, and Ramsar site). The designated AHLV exists at the northern borders of the study area. Nestos' Straits is a steep valley which is characterized by intense meanders and impressive relief. The area hosts a variety of habitats and is mostly undisturbed by human intervention. The only man-made intervention is a railway which is merged in with the overall scenery. Riparian forests can be also seen within the Serres plain section, specifically covering the area along Gazoros torrent, in the Wildlife Refuge of 'Chimaros Gazorou – Palia Zichni' and along a segment of Aggitis River, in the designated Area of High Landscape Value of Aggitis Gorge. Aggitis Gorge is characterised by riparian forest of planes (*Platanus orientalis)* and deciduous or evergreen shrubs. Aggitis Gorge is formed between Paggaio Mountain and Meniko Mountain, due to karstification, and has a length of approximately 15 km. The slopes can reach a height of up to 70 m and are covered mainly with maquis vegetation. Along the river, galleries of willows and planes are present. Cave of Alistrati is a karstic formation also included in the designated area.

- *Lake Vistonida Wetland*: Lake Vistonida is included in the National Park of Eastern Macedonia – Thrace and the complex of protected areas which includes 4 Natura 2000 sites, Wildlife Refuges and 2 Ramsar Sites, among others. Based on the description of the Natura 2000 site GR1130010 'LIMNES VISTONIS, ISMARIS - LIMNOTHALASSES PORTO LAGOS, ALYKI PTELEA, XIROLIMNI, KARATZA' *(i.e. Lakes Vistonida, Ismarida – Lagoons of Porto Lagos, Alyki Ptelea, Xirolimni, Karatza),* the overall wetland of Lake Vistonida and Porto Lagos lagoons include a series of coastal lakes and the outlet of rivers Kosynthos, Kompsatos, and Filiouris. Lake Vistonida is characterized by half brackish - half freshwater water and inflow by the rivers Kosynthos and Kompsatos. Porto Lagos lagoon presents high salinity and is a designated Area of High Landscape Value. There are different habitats: large reedbeds all around, Tamarix scrubs (one of the largest in Greece), salt marshes, dunes, bordering maquis hills and also agricultural cultivation extending close to the wetland plain which is bordered by hills. It must be noted that the study area includes a small section of the wetland, at the outskirts of the national park, next to industrial facilities, of small landscape value, but the proposed pipeline route does not cross this landscape unit and runs north of it.

- *Lagoons of Keramoti*: Lagoons of Keramoti are included in the National Park of Eastern Macedonia – Thrace and the complex of protected areas it includes (4 Natura 2000 sites, Wildlife Refuges and 2 Ramsar Sites, among others). Nestos' Delta creates the lagoons of the area. Based on the description of the Natura 2000 site GR1150001 'DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS KAI NISOS THASOPOULA' (*Nestos' Delta and Lagoons of Keramoti and Thasopoula Island)* the Keramoti lagoons are a complex of coastal saltwater lagoons, situated at the western extent of Nestos Delta, west of Keramoti town. The most important habitat types are large coastal dunes, saltmarshes, reedbeds, and especially beds of marine vegetation-communities of vascular plants (Zostera, Posidonia etc.). Fish-farms exist in each lagoon and in the proximity there are an airport and installations of an abandoned U.S. military radio station. It must be noted that the study area includes a small section of the protected lagoons, at the outskirts of the national park and next to industrial facilities, of small landscape value, and the proposed pipeline route does not cross this landscape unit but runs to the north of it.

- *Mixed grasslands and agricultural areas:* This landscape type is mainly present in the Vermio Mountain section and constitutes a transitional zone between the agricultural areas in the Axios Plain and Vermio Mountain foothills. The altitude of this area varies from 100 to

600 meters and it is mostly covered by agricultural lands interrupted by grasslands and shrubs.

- *Upland agricultural areas:* This type of landscape is widespread along the route - present within the Vermio Mountain, Ptolemaida Basin, Askio Mountain and Kastoria to Border sections. It is a landscape type typical of the mountainous areas of Greece, covering thousands of hectares. The mean altitude is 800 meters, although some of the cultivated plateaus have an altitude of up to 1,200 meters; the plateau of Variko village is a prime example of this. Pastures, meadows and grasslands are also present throughout this landscape type.

- *Agricultural areas with narrow valleys:* Areas of this type are present in Axios Plain section between Nea Mesimvria and Vathylakos village, as well as further north. The predominant agricultural areas are interrupted by narrow valleys of small streams covered by pine and platanus orientalis trees as well as deciduous shrubs.

- *Mountainous shrublands and grasslands:* Areas of this landscape type are present in the Vermio Mountain and Ptolemaida Basin sections, specifically on the Vermio Mountain slopes and Charakomata slopes. The altitude of these areas ranges from 300 meters to 1900 meters a.s.l. Mountainous slopes covered by shrublands and grasslands are the most characteristics for this landscape type. On the Vermio Mountain slopes these areas have historically been used for summer pasture.

- *Mountainous mixed agricultural areas with narrow valleys:* This landscape unit is present in the Kastoria to Border section and comprises a mosaic of agricultural lands in hills or mountains, grasslands and mixed forests of oaks (Quercus) and deciduous shrublands. The forests are mostly present in the narrow valleys along with natural riparian vegetation. These are mostly formed by rivers and streams and are typical of the area the Aliakmonas River runs through (southwest of Mesopotamia village). The altitude varies from 600 to 1,200 meters and the highest elevations are in the border area. Ieropigi, Koromilia, Lefki and Ampelohori are the most important villages within this landscape type.

- *Kastoria wetland:* The region of Kastoria has a distinct landscape type. The Kastoria Lake is a Natura 2000 special protected area (code GR1320003) as well as an Area of High Landscape Value (the lake and the peninsula). The lake is dominant in the area and is a unique type of lake landscape in Greece. The traditional town of Kastoria is located in the northwest of the lake and is an active region for crafts specializing in the fur industry. The

surrounding area predominantly consists of agricultural and riparian lands and is considered of high aesthetic and cultural value. It must be noted that the proposed pipeline route does not directly cross this landscape unit but runs to the south of it.

The above mentioned Landscape Character Types are shown in the maps of landscape types in *Annex 4.2* and illustrated with indicative pictures in *Annex 6.6.4*.

Table 6-40 presents the Landscape Character Types that are crossed by each section of the pipeline.

Table 6-40 Landscape Character Types along the Pipeline Route

Section	*From KP*	*To KP*	*Landscape Character Type*
River Evros Area (KP 0 – 13)	0	0,5	Evros Wetland
	0,5	15	Plain agricultural areas
Southern Evros (KP 13 - 62)	15	21,5	Plain agricultural areas
	21,5	24,5	Mountainous forested areas
	24,5	27	Hilly shrublands and grasslands
	27	32	Mountainous forested areas
	32	43,5	Plain agricultural areas
	43,5	45	Hilly shrublands and grasslands
	45	62	Mountainous forested areas
	62	62,5	Mixed forested and agricultural areas
Lowlands of Evros (KP 62 - 86)	62,5	64,5	Hilly shrublands and grasslands
	64,5	87	Plain agricultural areas
Komotini-Xanthi Plain (KP 86 - 176)	87	97	Plain agricultural areas
	97	97,2	Mixed riparian forested and agricultural areas
	97,2	98,4	Plain agricultural areas
	98,4	98,7	Mixed riparian forested and agricultural areas
	98,7	101,5	Plain agricultural areas
	101,5	101,7	Mixed riparian forested and agricultural areas
	101,7	135,5	Plain agricultural areas
	135,5	135,7	Mixed riparian forested and agricultural areas
	135,7	137,5	Mixed agricultural and urban or industrial features
	137,5	138,5	Plain agricultural areas
	138,5	141	Mixed agricultural and urban or industrial features
	141	153	Plain agricultural areas
	153	153,6	Riparian forested areas
	153,6	174,5	Plain agricultural areas
	174,5	174,6	Mixed agricultural and urban or industrial features
	174,6	175	Plain agricultural areas
Kavala Mountains (KP 176 - 193)	175	176,5	Mixed agricultural and urban or industrial features

Section	*From KP*	*To KP*	*Landscape Character Type*
	176,5	177,7	Mountainous forested areas
	177,7	180,5	Plain agricultural areas
	180,5	192	Mountainous forested areas
	192	195	Mixed agricultural and urban or industrial features
	195	197	Mountainous forested areas
Philippoi Plain (KP 193 - 225)	197	197,7	Mixed agricultural and urban or industrial features
	197,7	208	Plain agricultural areas
	208	208,5	Mountainous forested areas
	208,5	210	Plain agricultural areas
	210	212,5	Mountainous forested areas
	212,5	235	Plain agricultural areas
Serres Plain (KP 225 - 295)	235	236,5	Hilly shrublands and grasslands
	236,5	241	Plain agricultural areas
	241	246	Mixed forested and agricultural areas
	246	280	Plain agricultural areas
	280	280,2	Urban and industrial areas
	280,2	296,5	Plain agricultural areas
	296,5	296,9	Mixed riparian forested and agricultural areas
	296,9	301	Plain agricultural areas
	301	302	Mountainous forested areas
Kroussia Mountains (KP 295 - 329)	302	307	Mountainous forested areas
	307	311	Mixed forested and agricultural areas
	311	311,6	Mountainous forested areas
	311,6	315	Mixed forested and agricultural areas
	315	315,2	Mountainous forested areas
	315,2	315,7	Mixed forested and agricultural areas
	315,7	317	Mountainous forested areas
	317	328	Mixed forested and agricultural areas
	328	338	Hilly mixed grasslands and agricultural areas
Gallikos Plain (KP 329 - 359)	338	351	Plain agricultural areas
	351	359	Mixed forested and agricultural areas
Axios Plain (KP 359 – 425)	359.0	369.9	Plain Agricultural Areas
	369.9	371.4	Riparian Forested Areas
	371.4	419.8	Plain Agricultural Areas
	419.8	425.0	Upland Agricultural Area
Vermio Mountain Slopes (KP 425 – 466)	425.0	444.0	Mountainous Forested Areas
	444.0	455.7	Mountainous Shrublands & Grasslands
	455.7	466.0	Upland Agricultural Areas
Ptolemais Basin (KP 466 – 486)	466.0	477.0	Upland Agricultural Areas
	477.0	478.4	Mountainous Shrublands & Grasslands
	478.4	486.0	Upland Agricultural Areas

Section	*From KP*	*To KP*	*Landscape Character Type*
Askion Mountain slopes (KP 486 – 507)	486.0	492.3	Upland Agricultural Areas
	492.3	496.6	Mountainous Forested Areas
	496.6	507.0	Upland Agricultural Areas
Kastoria to border (KP 507 – 543)	507.0	536.2	Upland Agricultural Areas
	536.2	541.8	Mountainous Forested Areas
	541.8	543.2	Mountainous Mixed Agricultural Area

Source: ERM (2011), ASPROFOS (2013)

The Landscape Character Types along the pipeline route are evaluated with regard to their visual amenity in *Table 6-41.* The key criteria used for this evaluation are:

- Quality and Sensitivity: Importance at a regional or national level based on the degree that the landscape contains features that are distinctive, common or even intrusive.
- Sensitivity to Change: Sensitivity based on the existence of a legal protection status for the landscape and in relation to its distinctive character and capability to accommodate the type of change envisaged.

A detailed analysis of sensitivity is provided in *Annex 6.6.4*.

Table 6-41 Landscape Character Types Quality Assessment

Landscape Character Types (segments crossed)	*Sections*	*Quality*	*Sensitivity to the proposed changed*	*Total length through landscape type (km)*	*Magnitude of change*
Plain agricultural areas (22)	River Evros area, Southern Evros, Lowlands of Evros, Komotini-Xanthi Plain, Kavala Mountains, Philippoi Plain, Serres Plain, Gallikos Plain, Axios Plain	Ordinary	Low	316.55	Low
Mountainous forested areas (15)	Southern Evros, Kavala Mountains, Kroussia Mountains, Vermio Mountain, Askio Mountain, Kastoria-to-Border	High	High	76.17	Medium
Mixed forest and shrublands (7)	Serres Plain, Kroussia Mountain, Gallikos Plain	Good	Medium	32.09	Low

Landscape Character Types (segments crossed)	***Sections***	***Quality***	***Sensitivity to the proposed changed***	***Total length through landscape type (km)***	***Magnitude of change***
Mixed agricultural and urban or industrial features (6)	Komotini-Xanthi Plain, Kavala Mountains	Ordinary	Low	8.93	Low
Hilly shrublands and grasslands (6)	Southern Evros, Lowlands of Evros, Philippoi Plain, Serres Plain	Ordinary	Low	8.76	Low
Hilly mixed grasslands and agricultural areas (1)	Kroussia Mountains	Good	Low	7.41	Low
Urban and industrial areas (5)	Komotini-Xanthi Plain, Serres Plain, Axios Plain, Ptolemaida Basin	Ordinary	Low	0.22	Low
Mixed riparian forested and agricultural areas (6)	Komotini-Xanthi Plain, Serres Plain, Ptolemaida Basin, Askio Mountain	Good	Medium	1.41	Low
Evros wetland (1)	River Evros area	High	Medium	0.635	Low
Riparian forested areas (2)	Komotini-Xanthi Plain, Axios Plain	High	Medium	2.55	Low
Mixed agricultural areas with narrow valleys (1)	Axios Plain	Good	Medium	2.2	Low
Mixed grasslands and agricultural areas (1)	Vermio Mountain	Ordinary	Low	1.8	Low
Upland agricultural areas (7)	Vermio Mountain, Ptolemaida Basin, Askio Mountain, Kastoria-to-Border	Good	Low	50.2	Low
Mountainous shrublands and grasslands (2)	Vermio Mountain, Ptolemaida Basin	Ordinary	Low	15.5	Low
Mountainous mixed agricultural areas with narrow valleys (4)	Kastoria-to-Border	Good	Medium	1.5	Low
Kastoria wetland (1)	Kastoria-to-Border	Highest	High	0	Low

Source: ERM (2011), EXERGIA (2012), ASPROFOS (2013)

The natural elements, anthropogenic features and other landscape elements for the above mentioned landscapes are presented in *Annex 6.6.4*.

6.2.8.3 Areas of High Landscape Value

Within the study area, five (5) designated Areas of High Landscape Value (AHLV) and 16 areas that are considered to be of high value have been identified through the assessment study.

These areas are presented below (more specific analysis is provided in *Annex 6.6.4*):

- *Evros River and its Delta:* Evros river and its Delta is one of the most important and dominant wetlands in Greece and Europe. It holds a diversity of habitats in a relatively small area, several of them being of great importance for the Mediterranean region. The Delta is a Natura 2000 protected site (GR1110006). A small part of the Delta (in the southeast of Alexandropouli) is located in the buffer zone of the baseline – i.e. within 3 km distance from the pipeline route, in Southern Evros section.

- *Wildlife Refuge of Pylaia – Kavisos – Feres*: The Wildlife Refuge of Pylaia-Kavisos-Feres is part of the South Forest Complex of Evros. It is located at the Southern Evros section and the Landscape Type is defined as «Mountainous forested area». The pipeline routes runs at a distance of 1.5 km to the south of the area.

- *South Forest Complex of Evros*: The South Forest Complex of Evros is located at the south-eastern end of the Rodopi Mountain. It is a Natura 2000 protected site (GR1110009) and it is characterized by low hills covered with Quercus, Caprinus, Fraxinus and Acer woodland and scrub. It is an important site for breeding and wintering raptors and other resident species associated with forest. It is located in the Southern Evros section and the Landscape Types includes «Mountainous forested areas», «Mixed forested and agricultural areas», and «Hilly shrublands and grasslands».

- *Wildlife Refuge of Kirki*: The Wildlife Refuge of Kirki was established in 2001 in order to protect a wide area of 14,500 acres. The area is habitat for deer (*Capreolus capreolus)* breeding. It is located in the Southern Evros section and the Landscape Type is defined as «Mountainous forested areas». The pipeline route runs through the south section of the area for about 4 km.

- *Filiouris (Lissos) River*: Filiouris (Lissos) River is located in Lowlands of Evros section and the Landscape Type is defined as «Plain agricultural areas». Filiouris River is a Natura 2000 SCI site (GR1130006) and is also protected by the Ramsar Convention. The river is very long with a lot of streams flowing into the main body. A rich fauna and riparian vegetation exists along the river which flows through agricultural fields. The scenery is inspiring and is considered of high natural and aesthetic value even though degradation due to changes of land uses (for industrial and agricultural reasons) can be seen. The pipeline proposed route runs across the river for approximately 400 metres.

- *Bosbozis (Bosbos) River*: Bosbozis (aka Bosbos) River is located in Komotini-Xanthi Section in a Landscape Type defined as «Plain agricultural areas». Bosbozis River (pronounced Vosvozis) is included in the Wildlife Refuge of Chatisio and discharges into Lake Ismarida which is part of the National Park of Eastern Macedonia – Thrace. National Park of Eastern Macedonia – Thrace consists of a complex of protected areas, including 4 Natura 2000 sites, 2 Ramsar sites, and numerous wildlife refuges, among others. Although, the site is close to the urban centre of Komotini and the discontinuous urban fabric surrounding Komotini, it presents inspiring scenery and is deemed of high natural and aesthetic value. The proposed pipeline route crosses Bosbozis River and its tributary 'Trelochimarros' for approximately 250 m and 200 m, respectively.

- *Nestos River*: Nestos River is located in the Komotini-Xanthi plain section. Nestos River is protected by numerous protective legislations including the designated Area of High Landscape Value of Nestos' Straits. The designated area exists at the northern borders of the study area. Nestos' Straits is a steep valley which is characterized by intense meanders and impressive relief. Although the designated AHLV is not crossed by the project, some characteristics of high landscape value are present in the crossing point of the proposed pipeline route with the protected river. The crossing length is estimated at being approximately 600 m.

- *Palaia Kavala*: Palaia Kavala mountains is located in the Kavala Mountains section. Although it is not protected by any special status, the area is of high landscape value. The river of Palaia Kavala runs through the mountains and the competent authorities have created a recreational venue on its banks. The closest part of the proposed pipeline route runs at a distance of approximately 1,700 m.

- *Aesthetic Forest of Kavala – Amygdaleona/ Wildlife Refuge of Agios Timotheos - Kioupia:* Aesthetic forest of Kavala – Amygdaleona is a designated AHLV, with an area of 8.5 hectares around the city of Kavala. It was established in 1979 (HGG 606/D/28.10.1979). It is an artificial forest of great recreational and social value for the community of Kavala's broader area. Dominant species is Pinus nigra. The Wildlife Reserve of Agios Timotheos-Kioupia was established in 1976 (HGG 733/02.06.1976) and has an area cover of 2618 hectares. The area mainly consists of evergreen shrublands and some scattered settlements mainly for livestock but also hosts slopes with thick forests and beautiful relief. The proposed pipeline route crosses the area for approximately 3,800 m, but is outside the

designated AHLV of the Aesthetic forest (by a distance of approximately 800 m) but within the boundaries of the Wildlife Refuge.

- *Aggitis Gorge and Alistrati Caves*: Within the Serres Plain section, Aggitis River creates an impressive riparian forest and a landscape of aesthetic value. Aggitis Gorge is designated as an Area of High Landscape Value. It is characterised by riparian forest of planes (*Platanus orientalis)* and deciduous or evergreen shrubs. Aggitis Gorge is formed between Paggaio Mountain and Meniko Mountain, due to karstification, and has a length of approximately 15 km. The slopes can reach a height of up to 70 masl. and are covered mainly with maquis vegetation. Along the river, galleries of willows and planes are present. The breathtaking Cave of Alistrati is a karstic formation and also included in the designated area. The pipeline route runs at a distance of approximately 500 m north of the area.

- *Kroussia Mountains*: Kroussia mountains separate the Regional Entities of Kilkis and Serres. They consist of two low mountains: Disoro to the north-west and Mavrovouni to the south-east. The mountains host oak forests with significant open areas of shrublands and grasslands. Two Wildlife Refuges are located within the mountain range: Er. Makryotissa-Ampelia-Nisi-Rizana and Dimitritsiou – Triantafyllias. Part of the mountain range is deemed to be of high landscape value due to its natural, undisturbed vegetation and the impressive relief. The proposed pipeline route crosses the area for approximately 4400 m, but is outside of the Wildlife Refuges.

- *Axios River*: The Axios River is a Natura 2000 SCI and is also protected by the Ramsar Convention. The Landscape Type is “Riparian forested areas” with riparian forests of Platanus orientalis and deciduous or evergreen shrubs. The proposed pipeline route runs across this landscape for approximately 1.5 km.

- *Loudias River*: The Loudias River is also located in Axios Plain section and the Landscape Type is defined as «Plain agricultural areas». Loudias River contributes to the fertility of the arable area and for approximately 4 km poplar trees are located along its banks forming a long hedge that can be seen from kilometres away. The scenery is inspiring and is considered of high natural and aesthetic value. The proposed pipeline route runs parallel to this landscape for approximately 5.6 km.

- *Forested slopes of Vermio Mountain*: Vermio mountain’s pure forested slopes are located in Vermio mountain section and the Landscape Type is «Mountainous forested areas». The forests are mostly covered by a mosaic of forests composed of oaks (Quercus), beeches

(Fagus sylvatica), chestnuts (Castanea sativa), black pine trees (Pinus nigra) and deciduous shrublands. Part of Vermio mountain's forests are a Natura 2000 SCI (code GR1210001). The proposed pipeline route runs across the forest for approximately 8 km length.

- *Vegoritida Lake*: Vegoritida lake is located in Vermio Mountain section and two Landscape Types characterise the surrounding area «Mountainous shrublands and grasslands» and «Upland agricultural areas». The lake is a Natura 2000 SCI (GR1340004). The closest part of the proposed pipeline route runs at a distance of approximately 300 m.

- *Cheimaditida Lake (designated AHLV)*: Cheimaditida Lake is located in Askio mountain section and the Landscape Type is characterised as «Mixed riparian forested and agricultural areas». The lake is a Natura 2000 SPA (Code GR1340008) and a designated Area of High Landscape Value. The closest part of the proposed pipeline route runs at a distance of 1.8 km. From the lake, based on the viewshed analysis of the study area the pipeline is not visible.

- *Kleisoura, Lehovo and Variko region (designated AHLV)*: Kleisoura, Lehovo and Variko region is located in Askio mountain section and the Landscape Types are characterised as «Mountainous forested areas» and « Upland agricultural areas». The region is a designated Area of High Landscape Value and hosts the so called Kleisoura pass that connects the regions divided by the mountains. The surrounding forest includes oaks (Quercus), beeches (Fagus sylvatica) and other broadleaved trees. Kleisoura and Lehovo are old traditional settlements (since 17th century) with museums and old churches and had an active role in the Greek History during the period of the Macedonic Struggle. Variko village was built in a valley full of agricultural fields and poplar trees that used to be a marsh that was drained. The proposed pipeline route runs across the region for about 5.5 km. Based on the viewshed analysis, from Lehovo the pipeline is not visible.

- *Kastoria Lake (designated AHLV, by MD 26306/2367/1974)*: Kastoria Lake is located hosts the Landscape Type denominated «Kastoria wetland». The closest part of the proposed pipeline route runs at a distance of approximately 700 m.

- *Aliakmonas River*: Aliakmonas River is located in the Kastoria to border section and the Landscape Type is «Upland agricultural areas». The river is a European priority habitat type 91E0. Along the river, dunes and sands are the most dominant characteristics and

then agricultural areas are spreading. The proposed pipeline route runs across the river for approximately 700 m.

- *Koromilia Gorge (designated AHLV)*: Koromilia Gorge's starting point is located north of Koromilia village, on the edge of the study area. It is a designated Area of High Landscape Value and is considered to be Aliakmonas spring. Steep cliffs with small caves can be found along it and the river water runs throughout the whole year. The proposed pipeline route runs at a distance of 5.7 km away of the gorge starting point.

- *Forests in Greek/Albanian borders*: The forests of this unit that are considered of high value are located close to the Albanian-Greek border and the Landscape Type that characterizes the area is «Mountainous forested areas». They are mostly formed by oaks (Quercus), black pine trees (Pinus nigra) and deciduous shrublands. The proposed pipeline route runs through the forests and the closest distance to the deepest forests is 200 m.

Table 6-42 Areas of High Landscape Value Quality Assessment

Site	*Chainage (KP)*	*Sensitivity*
Evros River and its Delta	0-1, 35	Low
Wildlife refuge of Pylaia – Kavisos - Feres	16-20	Medium
South Forest Complex of Evros	35-62	Medium
Wildlife refuge of Kirki	50-53	High
Filiouris (Lissos) River	77	Low
Bosbozis (Bosbos) River	98	High
Nestos River	154	High
Palaia Kavala	187-190	High
Aesthetic Forest of Kavala – Amygdaleona/ Wildlife Refuge of Agios Timotheos – Kioupia	187-190	High
Aggitis Gorge and Alistrati Caves	224-231	High
Kroussia Mountains	296-303	High
Axios River	370-371	Medium
Loudias River	394	Medium
Forested slopes of Vermio Mountain	432-441	Medium (Sections of construction in elevated areas)
Vegoritida Lake	455	Low
Cheimaditida Lake	485	Low
Kleisousa, Lehovo and Variko Region	488-493	Medium (Sections of construction in elevated areas)
Kastoria Lake	506-520	Medium
Aliakmonas River	527-529	Low
Koromilia Gorge	532	Low
Forests in Greek/Albanian borders	536-541	Medium (Sections of construction in elevated areas)

Source: ERM (2011), EXERGIA (2012), ASPROFOS (2013)

6.2.8.4 Visual Amenity / Sensitivity of Views

The baseline visual amenity of the study area refers to several viewpoints along the pipeline route, pipeyards, construction camps, block valve stations and the Compressor Stations that represent a range of different viewer types and viewing opportunities. *Table 6-43* and *Table 6-44* present the evaluation of the sensitivity for each of the receptors selected. The KP of the viewpoints are given in *Sections 5.1, 5.2, 5.3* and *5.4* of *Annex 6.6.4*. A relative analysis of 'sensitivity' is provided in *Section 3.2.3* of *Annex 6.6.4*.

Table 6-43 Visual Receptors Sensitivity related to Block valve station, Pipeyards, Construction Camps

Viewpoint	*Landscape Character Type*	*Distance in km to site (approx.)*	*Direction of view*	*Receptor type*	*Sensitivity*
Block valve stations					
VP-E-54(A)	Plain agricultural areas	0.02	View to BVS01	Road	Low
VP-E-52	Plain agricultural areas	0.06	View to BVS02	Road	Low
VP-E-51	Hilly shrublands and grasslands	0.06	View to BVS03	Dirt Road	Low
VP-E-62	Plain agricultural areas	0.08	View to BVS04	Road	Low
VP-E-73	Plain agricultural areas	2.5	View to BVS05	Village	Low
VP-E-80	Plain agricultural areas	0.4	View to BVS06	Road	Low
VP-E-95	Plain agricultural areas	1.6	View to BVS07	Road	Low
VP-E-117	Plain agricultural areas	0.36	View to BVS08	Road	Low
VP-E-143	Plain agricultural areas	0.1	View to BVS09	Road	Low
VP-E-149	Plain agricultural areas	0.08	View to BVS10	Road	Low
VP-E-165	Plain agricultural areas	1.1	View to BVS11	Road	Low
VP-E-184	Mixed forested and agricultural areas	0.9	View to BVS12	Kefalochori outskirts	Medium
VP-E-198	Plain agricultural areas	0.2	View to BVS13	Road	Low
VP-9	Plain agricultural areas	0.4	View to BVS14	Road	Low
VP-76	Plain agricultural areas	0.5	View to BVS15	Track	Low
VP-26	Plain agricultural areas	0.7	View to BVS16	Road/ River	Medium
VP-28	Plain agricultural areas	0.03	View to BVS17	Road	Low
VP-31	Mountainous forested areas	0.1	View to BVS18	Village	Medium

Viewpoint	***Landscape Character Type***	***Distance in km to site (approx.)***	***Direction of view***	***Receptor type***	***Sensitivity***
VP-36	Upland agricultural areas	0.4	View to BVS19	Road	Low
VP-39	Upland agricultural areas	0.1	View to GBVS20	Road	Low
VP-77	Upland agricultural areas	0.1	View to BVS21	Road	Low
VP-56	Upland agricultural areas	0.3	View to BVS22	Road	Low
Pipeyards					
VP-E-61	Plain agricultural areas	0.1	View to GPY01	Road	Low
VP-E-21	Plain agricultural areas	0.06	View to GPY02	Road	Low
VP-E-49	Plain agricultural areas	0.1	View to GPY03	Road	Low
VP-E-69	Plain agricultural areas	0.8	View to GPY04	Road	Low
VP-E-83	Plain agricultural areas	0.8	View to GPY05	Road	Low
VP-E-127	Mixed agricultural and urban or industrial areas	0.5	View to GPY06	Road	Low
VP-E-143(A)	Plain agricultural areas	3.2	View to GPY07	Road/ Village	Low
VP-E-166	Plain agricultural areas	0.2	View to GPY08	Road	Low
VP-E-179	Plain agricultural areas	0.15	View to GPY09	Road	Low
VP-E-192	Mixed forested and agricultural areas	0.9	View to GPY10	Road/ Village	Medium
VP-E-198	Plain agricultural areas	1.8	View to GPY11	Road	Low
VP-50	Upland agricultural areas	0.9	View to GPY16	Road	Medium
VP-57	Upland agricultural areas	0.6	View to GPY17	Village	Low
NOTE: *Additional field visit required to establish visual receptors and sensitivity of GPY12-GPY15.*					
Construction camps					
VP-E-53(A)	Plain agricultural areas	0.2	View to GCAMP01	Road	Low
VP-E-66	Plain agricultural areas	0.8	View to GCAMP02	Road	Low
VP-E-127	Mixed agricultural and urban or industrial areas	0.04	View to GCAMP03	Road	Low
VP-E-166	Plain agricultural areas	0.2	View to GCAMP04	Road	Low
VP-E-198	Plain agricultural areas	2.8	View to GCAMP05	Road	Low
VP-24	Plain agricultural areas	1.2	View to GCAMP06	Road	Low
NOTE: *Additional field visit required to establish visual receptors and sensitivity of GCAMP07 and GCAMP08.*					

Source: ERM (2011), ASPROFOS (2013), EXERGIA (2012)

Table 6-44 Visual Receptors Sensitivity related to Pipeline Route

Viewpoint	*Distance in km to pipeline*	*Direction of view*	*Receptor type*	*Sensitivity*
VP-E-6	2.8	Viewing south towards the pipeline	Village	Low
VP-E-5	1.2	Viewing north towards the pipeline	Village	Low
VP-E-8	1.4	Viewing south towards the pipeline	Village	Low
VP-E-10	0.05	Viewing north towards the pipeline	River	Low
VP-E-11	0.02	Viewing north towards the pipeline	Village	Low
VP-E-13	0.01	Viewing north towards the pipeline	Village	Low
VP-E-14	2.5	Viewing north towards the pipeline	Village	Low
VP-E-15	0.1	Viewing south towards the pipeline	Village/Monastery	Medium
VP-E-17	0.3	Viewing north towards the pipeline	Village	Low
VP-E-18	0.08	Viewing south towards the pipeline	Village	Low
VP-E-19	1.0	Viewing south towards the pipeline	Village	Low
VP-E-23	0.01	Viewing south towards the pipeline	Village	Low
VP-E-24	0.01	Viewing north towards the pipeline	Village/brook	Low
VP-E-28	0.004	Viewing south towards the pipeline	Road	Low
VP-E-33	0.02	Viewing east towards the pipeline	Track	High
VP-E-39	0.8	Viewing east towards the pipeline	Road	Low
VP-E-42	0.1	Viewing north towards the pipeline	Village/brook	Low
VP-E-43	0.8	Viewing north towards the pipeline	River	Medium
VP-E-44	0.9	Viewing north towards the pipeline	Village	Low
VP-E-47	0.02	Viewing south towards the pipeline	Village/brook	Low
VP-E-63	0.6	Viewing north towards the pipeline	Village	Low
VP-E-67	0.5	Viewing north towards the pipeline	River	High
VP-E-69	0	Viewing west along the pipeline	Village	Low
VP-E-71	0.3	Viewing northwest towards the pipeline	River	Low
VP-E-74	0.69	Viewing southwest towards the pipeline	Village	Low
VP-E-77	0.5	Viewing south towards the pipeline	Village	Low
VP-E-81	0.66	Viewing north towards the pipeline	River	Medium
VP-E-82	0.3	Viewing south towards the pipeline	Road	Low
VP-E-84	0.1	Viewing north towards the pipeline	Road/ Village	Low
VP-E-86	0.01	Viewing south towards the pipeline	Village	Low
VP-E-88	0.06	Viewing west parallel to the pipeline	Village	Low
VP-E-91	0.4	Viewing northeast towards the pipeline	Nestos Crossing	High
VP-E-97	0.15	Viewing east towards the pipeline	Irrigation Channel	Low
VP-E-115	0.02	Viewing east towards the pipeline	Village	Low
VP-E-118	2	Viewing south towards the pipeline	Landscape	Medium
VP-E-129	3.5	Viewing west towards the pipeline	Village	Low
VP-E-134	7.5	Viewing north towards the pipeline	Landscape	Low
VP-E-147	4.5	Viewing northeast towards the pipeline	Landscape	Low
VP-E-155	1.5	Viewing southeast towards the pipeline	Landscape	Low
VP-E-172	0	Viewing south towards the pipeline	Road	Low
VP-E-183	0.15	Viewing south towards the pipeline	Landscape	Medium
VP-E-193	0	Viewing east towards the pipeline	Road	Low

Viewpoint	*Distance in km to pipeline*	*Direction of view*	*Receptor type*	*Sensitivity*
VP-E-200	0	Viewing northeast towards the pipeline	Road	Low
VP-E-210	0.5	Viewing north towards the pipeline	Road	Low
VP-11	1.8	Viewing north towards the pipeline	Village	Low
VP-17	1.8	Viewing north towards the pipeline	Village	Low
VP-18	0.8	Viewing north towards the pipeline	Village	Low
VP-22	0.7	Viewing east towards the pipeline	Village	Medium
VP-36	0.15	Viewing north towards the pipeline	Road	Low
VP-37	0.9	Viewing south towards the pipeline	Village	Medium
VP-40	0.3	Viewing north towards the pipeline	Village	Low
VP-44	0.2	Viewing north towards the pipeline	Village	Medium
VP-46	0.1	Viewing south towards the pipeline	Road	High
VP-47	0.9	Viewing south towards the pipeline	Village	Low
VP-58	1	Viewing north towards the pipeline	Village	Low
VP-61	0.9	Viewing south towards the pipeline	Village	Medium
VP-62	0.05	Viewing north towards the pipeline	Road	Medium
VP-63	2.3	Viewing south towards the pipeline	Road	Low
VP-64	3.1	Viewing south towards the pipeline	Church and hill top	Low
VP-65	2.5	Viewing south towards the pipeline	Village	Low
VP-71	3	Viewing north towards the pipeline	Village	Low

Source: ERM (2011), ASPROFOS (2013), EXERGIA (2012)

The visual amenity for the Compressor Stations (GCS00 and GCS01) facilities is presented in *Table 6-45.*

Table 6-45 Visual Receptors Sensitivity related to Compressor Stations

Viewpoint	*Distance in km to nearest site boundary (approx.)*	*Direction of view*	*Receptor type*	*Sensitivity*
GCS00				
VP-E-8	2.6	West view of the CS location	Village	Low
VP-E-2	0.5	Southeast view of the CS location	Road	Low
VP-E-57	2.1	Southwest view of the CS location	Village	Low
VP-E-4	0.2	Northeast view of the CS location	Road	Low
VP-E-6	2.3	Northwest view of the CS location	Village	Low
GCS01				
VP-E-GCS01_N(1)	1	North view of the CS location	Road/ Village	Low
VP-E-GCS01_NE(3)	1.2	North-East view of the CS location	Road	Low
VP-E-GCS01_SE(4)	2.6	South-East view of the CS location	Village	Low

Viewpoint	***Distance in km to nearest site boundary (approx.)***	***Direction of view***	***Receptor type***	***Sensitivity***
VP-E-GCS01_S(8)	2	South view of the CS location	Village	Low
VP-E-GCS01_SW(5)	1.2	Southwest view of the CS location	Road/ Village	Medium
VP-E-GCS01_NW(6)	1.2	North-West view of the CS location	Road	Low

Source: ASPROFOS (2013), EXERGIA (2012)

6.3 Biological Environment

6.3.1 Overview

This Section describes the biological resources along the Project base case route, focusing on a 500 m wide corridor (250 m either side of the proposed centreline) along its entire length – referred to herein as the 'Study Area'.

The following elements of the biological environment have been considered:

- flora and vegetation;
- fauna and habitats; and
- protected areas / sites of conservation interest.

6.3.1.1 Summary of Baseline Collection Activities

In total, six (6) separate field surveys took place aiming to provide baseline data on flora, fauna, vegetation as well as other ecological parameters of interest for the environmental baseline of the study area. Three (3) field surveys were performed in June and July 2011, and May 2012 for the Western section of the pipeline between Thessaloniki and the Greek Albanian border, and four (4) more field surveys took place in August, October 2012 and April and May 2013 for the Eastern Section between Thessaloniki and the Turkish border.

A brief summary of field survey activities undertaken to gather current baseline data for the biological environment is provided in *Table 6-46*. Annex 4.1 – Habitats and Protected Areas map, illustrates the visited sites and the results of the baseline study, including the results of the field surveys.

Table 6-46 Summary of Biological Environmental Baseline Surveys

Baseline Topic	*Study Area*	*Field Work Activity / Time*
Protected Areas	The full outline of the protected area and its elements in relation to the Project	June / July 2011, May 2012 for the West Section and August/ October 2012 and April/ May 2013, for the East Section.
Flora Survey	Recording the most common populations of flora species of conservation interest within the 500 m zone	For the West Section, preliminary work was undertaken during the route refining process (November 2010 and February 2011). The main field activities took place during June / July 2011 and May 2012 for the West Section and August/ October 2012 and April/ May 2013, for the East Section.
Fauna Survey	For large mammals (bear, wolf and jackal) broader areas were surveyed and suitable habitats in the Project's areas were studied also. For European ground squirrel and the reptiles/amphibians a distribution of habitats along the pipeline route was studied. The bird survey gave emphasis on little – known raptors, forest and meadow species	June / July 2011 and May 2012 for the West Section and August/ October 2012 and April/ May 2013, for the East Section.
Habitat Identification	Same as for flora and fauna above.	Same as for flora and fauna above.

Source: ASPROFOS (2013), ERM (2011)

The ecological field surveys involved, in total, more than 27 scientists who overall spent more than approximately one hundred and fifty(150) man-days in the field covering the whole distance of the TAP pipeline from the Greek/Turkish border to the Greek/ Albanian border, collecting field data on terrestrial and freshwater[15] ecology. They mainly worked within the 500 m study corridor but in certain cases, such as the large mammals, they moved out of the Project area so as to provide reliable information on ecological factors that operate on a larger geographical scale.

Extensive literature researches before and after the field survey provided important data on the biogeographical and ecological features of the area. The field survey focused only on certain elements of the flora, vegetation and fauna. These elements, either taxa or communities:

- are of strong conservation interest at a European or even international level or are rarities in Greece;
- are considered likely to be impacted during the construction or in some cases the operation of the pipeline;
- provide reliable means to monitor certain environmental aspects of the Project;
- have no taxonomic or biogeographical ambiguities; and

[15] At crossing points with main rivers and streams of perennial flow

- are feasible to observe and record taking into account the Project needs and constrains.

More specifically:

- The flora and vegetation survey focused on recording the most common populations of flora species of conservation interest within the 500 m zone in a statistically robust way, i.e. without over-representing some areas and ignoring others. Given that a total of 322 plant taxa of conservation interest is regionally known from literature and field surveys, it was expected that only some of these taxa were likely to be encountered during a single or two-season sampling (i.e. extreme rarities or stenotopic species are highly improbable to be encountered whatsoever. With regards to habitat types, the approach was to map the natural habitat units, and specifically the habitat types included in the Habitats Directive (92/43/CEE), within the 500m buffer zone or the Greek habitats[16] and vegetation types.
- The large mammals survey focused on three (3) species of high conservation interest in Greece: the bear (*Ursus actos)* and wolf (*Canis lupus*), together with a third flagship species of interest in the region, the jackal (*Canis aureus*)[17]. Highly sophisticated models were used to evaluate the Project area with regards to its suitability during the species' life cycle stages. Data from telemetry, literature and field data were combined to provide a realistic overview of the species' expected range in the vicinity of the Project. Field survey data and literature information on the presence of otter (*Lutra lutra*) at the river crossing points have been collected during the river ecology survey but the species' home range varies enormously and remains little known in northern Greece.
- The river ecology/hydrobiology groups worked on all major crossings of the TAP pipeline with rivers and streams of constant flow. In line with the requirements of the Water Framework Directive, they measured several physico-chemical parameters and provided quantitative information to calculate several indices of ecological water quality referring to riparian vegetation, freshwater fish, macroinvertebrates and diatoms. They have acquired important information on the freshwater fish community at the river crossing points. In some cases, the freshwater fish community is indeed of high conservation interest as the reported endemicity rate for several watercourses such as Aliakmonas exceeds 60%.
- The bird survey gave emphasis on little – known raptors, forest and meadow species for which there is not much information regarding their status in western Macedonia. Breeding locations have been a priority to spot when possible. Relatively rare habitats such as remnants of riparian forest that could host populations of species of conservation interest were surveyed with scrutiny.

[16] as defined in Dafis *et al.* (2001)
[17] The bear was investigated only in the West Section since no literature data indicated presence of the species in the East Section. Similarily, the Jackal was investigated only in the East Section since not literature data indicated presence of the species in the West Section.

- The reptiles – amphibian survey aimed at providing data on species presence along the pipeline route.The Macedonian herpetofauna includes 14 snakes, 11 lizards, 5 turtles, 9 anurans and 3 urodelan amphibians but no Macedonian endemic species have been described. Emphasis was therefore given to the two species of terrestrial tortoises, *Testudo graeca* and especially *Testudo hermanni* both protected according to Directive 92/43 EE.
- The small mammal survey focused on recording in a systematic way the distribution of *Spermophilus citellus* (European ground squirrel) colonies within the 500 m zone. The survey led to empirical information on other taxa as well (*Microtus sp., Talpa sp., Rattus sp*.) however these animals bear many taxonomic difficulties when assessing them during field work. On the other hand, *Spermophilus citellus* is a mammal of high conservation interest, notorious for being strongly affected by land use changes and a species in need of special mitigation measures when performing underground constructions within its habitat.

More information on the methodology applied for the different aspects of flora and fauna is given in *Annexes 6.5.1 to 6.5.9.*

The Baseline Study was focused on:

- Natural habitats, especially at sites where human activity has not essentially modified the area's primary ecological functions (i.e. dense forests in mountainous areas).
- Modified habitats (such as agricultural areas), although not of high ecological value these areas were also surveyed.
- Critical habitats, such as areas of high biodiversity value or having an importance to the survival of endangered or rare or endemic species. Critical habitats are either protected under a legal frame (i.e. Natura Sites) or not protected (i.e. habitats of *Spermophilus citellus*).
- Protected and designated areas, such as Natura Sites, Wildlife Refuges, IBAs, National Parks etc.

All the above areas are analyzed in the proceeding Section and in Annex 6 where supporting details are provided.

6.3.1.2 Sections of the route along which biodiversity data are provided

For the purposes of the ESIA the pipeline route has been segregated in a number of sections according to local and specific environmental characteristics of the areas crossed along the route. The following table comprises the 14 sections of the route considered in this study:

Table 6-47 Baseline study sections of the pipeline route

Section	*From KP*	*To KP*	*General Description*
East Section (KP 0 – KP 359)			
River Evros Area	0	13	The river Evros area mostly comprises intensively cultivated areas and human-impacted streams. 2 flora taxa of conservation interest were recorded. The site hosts a territory of Jackal and habitats with potential to hold colonies of the European Ground Squirrel (*Spermophilus citellus*).
Southern Evros	13	62	Shrubs and oak forests within the southern Evros section comprise populations of some flowering taxa of conservation interest (14 in total). The section hosts Jackals (*Canis aureus*) and Wolves (*Canis lupus*) and has great abundance of bird species of conservation concern especially at the Loutros forest area.
Lowlands of Evros	62	86	This area comprises agricultural land with patches of shrubland. 5 flora taxa of conservation interest were recorded. The section hosts a colony of European Ground Squirrel (*Spermophilus citellus*). A small colony of European Bee-eater (*Merops apiaster*) and a potential home-range of Levant Sparrowhawk (*Accipiter brevipes*).
Komotini – Xanthi Plain	86	176	The Komotini- Xanthi Plain section crosses the northern border of the National Park of East Macedonia- Thrace through an intensively cultivated area. The route crosses two major rivers, Kompsatos and Nestos. Extensive riparian vegetation is found along Nestos crossing. 7 flora taxa of conservation interest have been recorded. One of the largest territories of Jackal in Greece is in proximity to the pipe and the area is hosting significant bird species populations.
Kavala Mountains	176	193	This section is hilly and comprises shrublands and some parts of the section overlap with industrial zones. 5 flora taxa of conservation interest have been recorded. Habitats for wolf (*Canis lupus*) were identified.
Filippoi Plain	193	225	The area comprises of agricultural land with limited biodiversity records. 3 flora taxa of conservation interest have been recorded. The route crosses Aggitis River.
Serres Plain	225	296	This section is mainly cultivated in an overall flat terrain with some hills and is crossed by river Strymonas. Jackals and important bird species such as the Black Stork (*Ciconia nigra*), Calandra Lark (*Melanocorypha calandra*) and European Roller (*Coracias garrulus*) are present in the area. 3 flora taxa of conservation interest have been recorded.
Kroussia Mountains	296	329	Extensive oak forests as well as evergreen shrubland and meadows cover the hilly areas at Kroussia mountains. Beech forests develop locally. 12 flora taxa of conservation interest have been recorded.The area holds a large Wolf (*Canis lupus*) territory and the home range of Lesser Spotted Eagle (*Aquila pomarina*).
Gallikos Plain	329	359	Gallikos plain section is characterized mainly by arable land with shrubland at the uphill areas and it is crossed by Gallikos River. 4 flora taxa of conservation interest have been recorded.The European Ground Squirrel (*Spermophilus citellus*) has colonies in the section. A breeding area of the Long-legged Buzzard (*Buteo rufinus*) can be found here.
West Section (KP 359 – KP 543)			
Axios Plain	359	425	The section is mainly agricultural land without hosting any important flora species. Colonies of European ground squirrel (*Spermophilus citellus*) were found.
Vermio Mountain slopes	425	466	In general, Mount Vermio hosts the majority of flora taxa of conservation interest recorded, namely 16 protected, 8 Balkan endemic and 1 rare species. Habitats for wolf (*Canis lupus*) and bear (*Ursus arctos*) were identified.
Ptolemaida Basin	466	486	The section is mainly agricultural land without hosting any important flora species. Colonies of European ground squirrel (*Spermophilus citellus*) were found.

Section	*From KP*	*To KP*	*General Description*
Askion Mountain slopes	486	507	7 protected and 3 Balkan endemic flora species were recorded in the montane and subalpine areas near Kleisoura village. Habitats for wolf (*Canis lupus*) and bear (*Ursus arctos*) were identified.
Kastoria-to-border	507	543	Two protected orchid species, Cephalanthera rubra and Dactylorhiza saccifera were recorded at the crossings of Aliakmonas River near Kastoria. Habitats for wolf (*Canis lupus*) and bear (*Ursus arctos*) were identified.

Source: ASPROFOS (2013), (EXERGIA 2012), ERM (2012)

6.3.2 Flora and Vegetation

The following sections present an overall view of the characteristics and findings of the pipeline route. For consistency with the other sections of the baseline data, the information is organized in sections and divided between the so called East and West sections of the route. Focus has been given on protected flora species and habitat types that are described in the European and National legislation as endangered or protected, etc.

North Eastern Greece including central Macedonia is characterized by extensive flat agricultural areas occupying most of its southern parts and high mountains delineating to the north of the Greek-Bulgarian borders. Vegetation formations include evergreen and deciduous shrubland and forests, grasslands, riparian forests and wetland and coastal vegetation near the sea. Undoubtedly the most interesting in terms of vegetation and flora is the Rodopi mountain range, which hosts the single locality of *Picea abies* in Greece, as well as other high elevation forest species which are rare in the country, such as *Pinus sylvestris, Betula pendula* and *Populus tremula* (Dimopoulos *et al.,* 2012), these however stand at a distance of several kilometersfrom the pipeline route. Interesting formations can be found including *Quercus ilex* formations and the rare *Quercus ithaburensis* subsp. *macrolepis* forests (Dimopoulos *et al.,* 2012) which are within the study area. Rivers and streams host locally extensive riparian forests and galleries, which are mostly dominated by willow (*Salix* spp.), poplar (*Populus* spp.) or oriental plane (*Platanus orientalis*) (Dafis *et al.*, 2001). Strictly local endemics are rather infrequent, while many interesting endemic elements are associated with the adjacent areas of Bulgaria and Turkey.

The easternmost part of the pipeline route (KP 0 to 87) is located at the southern parts of the region crossing mostly flat lowland areas and the southern lowland foothills of the Rodopi mountain range. Agricultural land predominates along the route holding about 70%[18] of the

[18] Percentages calculated from Corine Land Cover for a 500 m buffer zone of the route.

project area, whereas other man-made habitats (urban and industrial areas) are rather infrequent covering less than 1%. Natural or semi-natural vegetation covers the rest of the project area, comprising mostly pine and oak forests (about 19%), scrub and herbaceous vegetation (about 9%) and to a lesser extent pastures (about 1%). Although important wetland areas, such as the Ramsar sites of the Evros river delta and Ismarida lake, are found at the vicinity of the project area, inland water areas crossed by the pipeline are rather restricted covering about 0.1% of the project area, with the Filiouris river (GR1130006) being the largest one.

From Komotini to Thessaloniki (KP 87 - 359), the larger parts of the study area are arable lands. In between the fields small rivulets and hedges can be found, where semi-natural and synanthropic vegetation dominate; species such as *Ulmus minor*, *Celtis australis*, *Paliurus spina-christi*, *Rubus* ssp. can be found. Floristic diversity is assumed to be low because of the nitrophilous species competition so that important species are missing. However hedges are thought to be of high ecological importance, since they serve as habitats (nests, refugees or corridors) for wildlife species (fauna and flora included).

Streams and rivers pass through the valleys of the study area dominated by *Salix alba-Populus alba* and *Platanus orientalis* galleries. Abandoned fields and semi-natural grasslands are dominated mostly by common synanthropic taxa (species and subspecies), such as *Artemisia campestris*, *Urtica dioica*, *Sisymbrium officinalis*. Many species of these areas are invasive; such as *Solanum eleagnifolium* and the poisonous *Datura stramonium*.

In the hills and the foothills of high mountains, there are extensive forests and shrubland; the common forest vegetation type is *Quercus coccifera* shrublands, where except for the dominant species *Phillyrea latifolia*, *Fraxinus ornus* and *Carpinus orientalis* can be found. Small patches of evergreen shrublands can be found on the foothills of Mt.Pangeo (or Pangaio), dominated by *Erica* spp.,*Arbutus* spp. etc. Stands of *Quercus* forests are found in the foothills of high mountains, dominated by *Quercus frainetto*, while in the same area reforestations with allochthonous species are found. Because of the historical heavy grazing, numerous openings and patches of grasslands inside forest vegetation types are found.

Western and central Macedonia Regions host a variety of vegetation formations from sea to alpine level including wetland and coastal vegetation, evergreen and deciduous shrubland and forests, riparian forests, dry and wet grasslands and meadows. The area counts as among the

most forested in Greece, holding about 25% of the total Greek forest cover (Voulgaris *et al*., 2010). Among the evergreen forest formations at the montane and subalpine levels the *Pinus nigra* forests, a European priority habitat (EU code 9530), and the Balkan *Pinus heldreichii* and *Abies* x *borisii-regis* forests are included. Deciduous forest formations include the *Fagus sylvatica* forests and mixed broad-leaved forests dominated by oaks (Boratynski et al., 1992; Strid and Tan, 1997; Phitos et al, 2009). Riparian forests and galleries develop along rivers and streams with permanent or seasonal flow and are mostly dominated by *Salix alba, Populus alba, Platanus orientalis* and/or *Alnus glutinosa* (Dafiset al., 2001). Grasslands and meadows, especially at the montane, subalpine and alpine levels, host numerous rare, endemic and endangered plant species (Strid and Tan, 1997).

The sections presented below describe the most important findings from the comprehensive literature review and the field study conducted for flora and vegetation of the Study Area, which is included in the relative Annex of the ESIA (*Annex 6.5.1*).

6.3.2.1 Flora Species

An extensive literature review has identified that more than 322 plant species and subspecies are located within the Study Area (Strid, 1986; Strid and Tan, 1991, 1997, 2002; Boratynski *et al.*, 1992; Karousou *et al*., 2000; IUCN, 2001; Chochliouros, 2005; Babalonas et al., 2009a-h; Phitos *et al*., 2009a, b).

The field surveys have led to verifying and recording the presence of some of these species within the 500 m zone, 62 of which are of high conservation interest (protected taxa[19], Balkan endemic taxa, or rare taxa). Key taxa within the Study Area are listed below. It must be noted that certain species such as *Himantoglossum caprinum, Ophrys sphegodes* subps. *Epiroticaand Scutellaria rupestris* subsp. *adenotricha,* fall within more than one category. Also, unidentified species of *Orchidaceae* have been recorded in various locations.

In the East Section (359 km) a total of 279 sampling locations then 83 included taxa of conservational interest (e.g. protected, Balkan endemic and/or rare). Among these on 12 occasions the species were observed to be within the 38 m working strip (most of them were in

[19] Protected under Greek nature conservation law (*Protected according to PD67/81)*

the Southern Evros area and in Kroussia mountains). The abundance of several of the taxa of interest indicates that they are relatively widespread and therefore possibly present in other areas along the Project footprint (i.e. not restricted to the sampling locations). Because of this the kilometer allocation of species has to be taken as indicative of the field findings, although species will certainly exist at several other sites as well.

The key species and reference sites are presented below for reference:

- *Ruscus aculeatus* which is included in Annex IV of Directive 92/43/EEC. This is a species abundant in the wider NE Greece and therefore has been found in numerous locations which are listed below:
    - KP 304.5/ 200 m, KP 300/ 0 m, KP 296.1/ 50 m, KP 188.9/ 10 m, KP 190.5/ 180 m, KP 183.3/ 50 m, KP 159.7/ 100 m, KP 159.1/ 20 m, KP 123.2/ 60 m, KP 62.3/ 70 m, KP 60.2/ 100 m, KP 31.6/ 0 m, KP 29.5/ 0 m, KP 18.8/ 40 m, KP 123/ 451.7 m, KP 159,5/ 494.3 m, KP 159/ 479 m, KP 159/ 506.7 m, KP 158.5/ 99 m, KP 210/ 1,080 m, KP 210/ 486.6 m, KP 208/ 561.8 m, KP 305.5/ 7194.1 m, KP 307/ 6,961.8 m.
- A total of 16 flora species of interest due to (1) their inclusion in the list of “Other Important Plant Species” (Kokkini *et al.*, 1996) or (2) because they are considered to be Balkan or sub-Balkan endemic species have been identified. All of these are either pioneer species or have a wide distribution in the region. The list of species and locations at which each of these were found are presented below:
    - *Fraxinus angustifolia* recorded at KP 13, KP 24, KP 77.5/ 26 m, KP 81/ 27 m
    - *Erysimum crassistylum* recorded at KP 319.6/ 50 m, KP 317.7/ 0 m, KP 261.7/ 110 m, KP 238/ 20 m, KP 233.1/ 190 m, KP 228/ 40 m, KP 227.1/ 130 m, KP 347.1/ 40 m, KP 190.5/ 180 m, KP 183.3/ 50 m, KP 125.9/ 60 m, KP 40.3/ 40 m, KP 18.8/ 40 m, KP 126/ 66.8 m, KP 161/ 604.9 m, KP 188/ 1507.8 m, KP 348/ 77.1 m
    - *Dianthus monadelphus* recorded at KP 126/ 67 m
    - *Minuartia attica* recorded at KP 307.1/ 20 m, KP 60.2/ 100 m, KP 155/ 138.1 m
    - *Digitalis viridiflora* recorded at KP 188/ 1507.8 m, outside of buffer zone
    - *Dianthus cruentus* recorded at KP 208/ 561.8 m, KP 305.5/ 7,194.1 m, KP 305/ 8,118 m KP 307.5/ 7,231.4 m, KP 348/ 77.1 m

- *Helleborus odorus* ssp*. cyclophyllus* recorded KP 317.7/ 0 m, KP 306.1/ 50 m, KP 305.7/ 110 m, KP 308/ 6929.3 m KP 307.5/ 7393.2 m, KP 307/ 6961.8 m
- *Centaurea affinis* recorded KP 307/ 6,961.8m, outside of the buffer zone
- *Verbascum phoeniceum* ssp*. flavidum* recorded at KP 319.6/ 50 m, KP 304.5/ 304.8/ 70 m, KP 304.5/ 200 m, KP 300/ 0 m, KP 160.7/ 120 m, KP 305.5/ 7,194.1 m
- *Crocus pulchellus,* recorded at about KP 55-61 /22-90 m
- *Colchicum turcicum,* recorded about KP 64, KP 75 (216 m) and KP77 (225 m),
- *Fritillaria pontica* recorded at KP 304.8/ 70 m, KP 306.1/ 50 m
- *Geocaryum capillifolium* recorded at KP 304.5/ 200 m
- *Hypericum rumeliacum* recorded at KP 233.1/ 190 m
- *Bromus cappadocicus* recorded atKP 190.5/ 180 m
- *Dianthus stenopetalus*recorded at KP 329.9/ 0 m).

- 2 Greek endemic species The Greek endemic *Satureja pilosa* subsp. *origanita* (included in the list of "Other Important Plant Species" -Kokkini *et al.*, 1996-) and recorded at about KP 77.5 and KP 61/ 207 m, and *Onosma halacsyi* recorded at KP 53.1/ 30 m, KP 30.9/ 210 m.
- 8 species protected under the Greek or international species legislation were found, six of which were orchid species*:*
  - *Platanus orientalis,* protected by the Greek legislation was recorded at KP 25/ 190 m, KP 26/ 216 m, KP 26.5/ 27 m, KP 29.9/ 50 m, KP 41.8/ 0 m, KP 50/ 1.1 km, KP 104/ 0 m, KP 113/ 30 m, KP 126/ 100 m, KP 179/ 40 m, KP 194/ 0 m, KP 237/ 0 m, KP 238/ 0 m, KP 321/ 110 m
  - *Spiranthes spiralis,* protected by the Greek legislation. Recorded at one location (KP 59/ 84m)
  - *Juniperus excelsa,* protected by the Greek legislation. Recorded at 2 locations only (KP 31.6/ 0 m and KP 46.1/ 20 m)
  - 5 Orchid species, protected under the Greek Law and international convention:
    - *Orchis purpurea* recorded at KP 42.1/ 50 m, KP 48.5/ 30 m, KP 56.5/ 210 m, KP 60.2/ 100 m
    - *Ophrys mammosa* recorded at KP 154/ 20 m, KP 328.9/ 130 m, KP 329.9/ 0 m

- *Anacamptis morio* ssp. *Caucasica* recorded at KP 296.1/ 50 m, KP 304.8/ 70 m, KP 325.3/ outside of the buffer zone
- *Ophrys oestifera* recorded at KP 48.5/ 30 m and *Cephalanthera epipactoides* recorded at KP 48.5/ 30 m.

From KP 359 to KP 543 (*West Section)* from the 100 locations where populations of taxa of conservation interest (protected, Balkan endemic and/or rare) were recorded in the 500 m zone, 11 were observed to be within the 38 m working strip. Among these, 9 were in the Vermio Mountain slopes section (approx. KP 427.0, 427.4, 427.9, 433.5, 438.7, 442.3, 442.4, 444 and 450.2), 1 in the Eordea Plain section (KP 478) and1 located in the Kastoria-to-border section (approx. KP 536.3). Taxa of conservation interest have been recorded in 3 locations along the 8 m pipeline protection strip within the Vermio Mountain slopes section (approx. KP 427.4, 438.7, 442.3. The abundance of several of these taxa indicates that they are more widespread and it is highly probable that they are to be found in many more additional sites along the Project area. The kilometer allocation of species is indicative, as several of them are certain to exist in several other sites as well.

The key species found in the West section of the pipeline are presented below for reference:

- 1 taxon included in Annex II of the Directive 92/43/EC (Habitats Directive): *Himantoglossum caprinum* (and protected in Greece)
- 21 taxa protected by the Greek legislation: *Anacamptis coriophora, A. morio, A. papilionacea, A. pyramidalis, Atropa bella-dona, Cephalanthera longifolia, C. rubra, Dactylorhiza saccifera, Epipactis sp., Himantoglossum caprinum, Limodorum abortivum, Neottia nidus-avis, Ophrys apifera, O. scolopax subsp. cornuta, O. sphegodes subsp. epirotica, O. sphegodes subsp. Mammosa, Orchis mascula, Platanthera chlorantha, Platanus orientalis, Scutellaria rupestris subsp. adenotricha and Spiranthes spiralis*
- 16 Balkan endemic[20] taxa: *Achillea holosericea, Anthyllis vulneraria subsp. bulgarica, Centaurea napulifera subsp. napulifera, Dianthus stenopetalus, Galium oreophilum, Linaria peloponnesiaca, Linum hologynum, Paronychia macedonica, Phlomis samia, Polygala supina subsp. rhodopea, Scabiosa tenuis, Silene atropurpurea, Stachys iva, S. plumosa, Scutellaria rupestris subsp. adenotricha* and *Ophrys sphegodes subsp. epirotica*

[20]Balkan endemics: taxa whose worldwide distribution encompasses the whole or parts of the Balkan peninsula

- 1 rare[21]in Greece taxon: *Paeonia peregrinea*
- 1 Greek endemic taxon*: Veronica chamaedrys* subsp. *chamaedryoides*

The following subsections describe the baseline conditions of flora taxa found along the fourteen sections of the Study Area along the route.

6.3.2.1.1 River Evros

The river Evros section has a total length of 13 km and mostly comprises intensively cultivated areas and human-impacted streams. Here there is limited evidence of frequent occurrence of protected/endemic taxa (*Table 6-48*) (i.e. only 2 species of interest where found in the 13 km section).The flora taxa of conservation interest found in the River Evros section are presented in *Table 6-48.*

Table 6-48 Flora Taxa of Conservation Interest within the River Evros Section

No.	*Latin name*	*Common name*	*Recorded Populations*	*Anticipated range*	*Reason of conservation*
1	*Colchicum turcicum* (Colchicaceae)		FH-285 (KP 12, outside of buffer zone)	Sporadic[22]	Balkan subendemic
2	*Fraxinus angustifolia* (Oleaceae)	Narrow-leaved ash	FH-275 (KP 13, 5 m)	Sporadic	Other Important Plant Species list

Source: EXERGIA field survey (October 2012)

6.3.2.1.2 Southern Evros

The Southern Evros section includes 49 km of the proposed pipeline route. Here a total of 14 plant taxa of conservation interest were found (*Table 6-49*), mainly in pine and oak forests. *Crocus pulchellus* and *Platanus orientalis* where the 2 species found in most sites (in 9 and 7 sites respectively). The flora taxa of conservational interest found in the Southern Evros section are presented in *Table 6-49*.

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[21]As defined in the Red Data Book – Greece (flora)
[22] Appearing singly or at widely scattered localities even though the population may be large

Table 6-49 Flora Taxa of Conservation Interest along the Southern Evros Section

No.	*Latin name*	*Common name*	*Recorded Populations*	*Anticipated range*	*Reason of conservation*
1	*Crocus pulchellus* (Iridaceae)		FH-211 (KP 59, 93 m), FH-247 (KP 57, out of buffer), FH-255 (KP 55.5, 22 m), FH-256 (KP 56, 90 m), FH-257 (KP 56.5, 169 m), FH-258 (KP 57, 35 m), FH-259 (KP 57, 37 m), FH-260 (KP 58, 85 m), FH-261 (KP 58, out of buffer)	Sporadic	Balkan subendemic
2	*Platanus orientalis* (Platanaceae)	Oriental Plane	FH-216 (KP 41, 8 m), FH-224 (KP 26.5, out of buffer), FH-225 (KP 26.5, 27 m), FH-226 (KP 26, 216 m), FH-230 (KP 25, 190 m), FH-262 (KP 50, 1.1 km), KP 29.9, 50 m	Sporadic	Protected under PD67/81
3	*Fraxinus angustifolia* (Oleaceae)	Narrow-leaved ash	FH-232 (KP 24, 9 m),	Sporadic	Other Important Plant Species list
4	*Spiranthes spiralis* (Orchidaceae)	Autumn Lady's-tresses	FH-212 (KP 59, 84 m)	Rare[23]	Protected under PD67/81
5	*Malus trilobata* (Rosacae)	Crab apple	KP 29.5, 0 m	Rare	Vulnerable (Rare Data Book of Greece)
6	*Cistus ladanifer* (Cistaceae)	Gum cistus	KP 30.9, 210 m, KP 49.8, 0 m	Rare	Rare in Greece (only in Thrace)
7	*Juniperus excelsa* (Cupressaceae)	Greek juniper	KP 31.6, 0 m, KP 46.1, 20 m	Rare	Protected under PD67/81
8	*Orchis purpurea* (Orchidaceae)	Lady orchid	KP 42.1, 50m, KP 48.5, 30m, KP 56.5, 210m, KP 60.2, 100m	Sporadic	Protected under PD67/81
9	*Ophrys oestifera* (Orchidaceae)		KP 48.5, 30m	Rare	Protected under PD67/81
10	*Cephalanthera epipactoides* (Orchidaceae)		KP 48.5, 30m	Rare	Protected under PD67/81
11	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 60.2, 100 m, KP 31.6, 0 m, KP 29.5, 0 m, KP 18.8, 40 m	Very common	Annex IV, Directive 92/43/EEC
12	*Erysimum crassistylum* (Cruciferae)		KP 40.3, 40 m, KP 18.8, 40 m,	Very common	Balkan endemic
13	*Minuartia attica* (Caryophyllaceae)		KP 60.2, 100 m	Sporadic	Balkan endemic
14	*Onosma halacsyi* (Boraginaceae)		KP 53.1, 30 m, KP 30.9, 210 m	Rare	Greek endemic

Source: EXERGIA field survey (October 2012), NCC field survey (May 2013)

[23] Of small population and/or of narrow biogeographical range

6.3.2.1.3 Lowlands of Evros

This section covers a total length of 24 km along the proposed pipeline route and comprises agricultural land with patches of shrubland. Here a total of 5 species of interest were identified, *Colchicumturcicum*being the one found in more sites (4 in total).The flora taxa of conservational interest found in the Lowlands of Evros section are presented in *Table 6-50*.

Table 6-50 Flora Taxa of Conservation Interest along the Lowlands of Evros Section

Nr.	*Latin name(Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Colchicumturcicum* (Colchicaceae)		FH-244 (KP 75, out of buffer), FH-245 (KP 77, 225 m), FH-250 (KP 64, 10 m), FH-251 (KP 65, outside of buffer zone)	Sporadic	Balkan subendemic
2	*Crocus pulchellus* (Iridaceae)		FH-208 (KP 60.5, 219 m)	Sporadic	Balkan subendemic
3	*Fraxinus angustifolia* (Oleaceae)	Narrow-leaved ash	FH-239 (KP 77.5, 26 m), FH-241 (KP 81, 27 m)	Sporadic	Other Important Plant Species list
4	*Satureja pilosa* subsp.*Origanita* (Lamiaceae)		FH-207 (KP 61, 207 m), FH-236 (KP 77.5, 7 m)	Rare	Greek endemic, Other Important Plant Species list
5	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 62.3/ 70 m	Very common	Annex IV, Directive 92/43/EEC

Source: EXERGIA field survey (October 2012), NCC field survey (May 2013)

6.3.2.1.4 Komotini- Xanthi Plain

The Komotini- Xanthi Plain section covers a section of 90 km along the proposed pipeline route. Here the route crosses the northern border of the National Park of East Macedonia- Thrace, an area of intensive agricultural character. Coastal lagoons are located further south from the pipeline. Two major rivers, Kompsatos and Nestos, are crossed by the route. The bulk of the riparian forest of Kotza Orman also lies further south from the pipeline close to the sea but extensive riparian vegetation may be also found along the Nestos crossing as well. Here a total of 7 different species of interest were identified. *Ruscus aculeatus* (in 8 different sites), *Erysimum crassistylum* (in 3 sites) and *Platanus orientalis* (in 3 sites) were found on more occasions.The flora taxa of conservational interest found in the Komotini – Xanthi plain section are presented in *Table 6-51.*

Table 6-51 Flora Taxa of Conservation Interest along the Komotini – Xanthi Plain Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 159.7, 100m, KP 159.1, 20m, KP 123.2, 60m, KP 123, 451.7m, KP 159,5, 494.3m, KP 159, 479m, KP 159, 506.7m, KP 158.5, 99m,	Very common	Annex IV, Directive 92/43/EEC
2	*Erysimum crassistylum* (Cruciferae)		KP 125.9/ 60m, KP 126/ 66.8m, KP 161/ 604.9m,	Very common	Balkan endemic
3	*Verbascum phoeniceum* ssp. *flavidum* (Scrophulariaceae)		KP 160.7, 120m	Sporadic	Balkan endemic
4	*Platanus orientalis* (Platanaceae)	Oriental Plane	KP 104/ 0m, KP 113/ 30m, KP 126/ 100m	Sporadic	Protected under PD67/81
5	*Ophrys mammosa* (Orchidaceae)	Early spider orchid	KP 154/ 20m	Rare	Protected under PD67/81
6	*Dianthus monadelphus*	Wild carnation	KP126/ 66.8m	Rare	Balkan endemic
7	*Minuartia attica* (Caryophyllaceae)		KP 155/ 138.1m	Sporadic	Balkan endemic

Source: Compiled by NCC (Asprofos field survey August 2012, May 2013)

6.3.2.1.5 Kavala Mountains

This section covers 17 km along the proposed pipeline route. The section is hilly in nature and comprises shrubland as well as parts of an industrial character. Here a total of 5 species of interest were identified. *Ruscus aculeatus* and *Erysimum crassistylum*were found in more sites (3 sites in both cases).The flora taxa of conservational interest that were found in the Kavala Mountains section are presented in *Table 6-52.*

Table 6-52 Flora Taxa of Conservation Interest along the KavalaMountains Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 188.9, 10 m, KP 190.5, 180 m, KP 183.3, 50 m	Very common	Annex IV, Directive 92/43/EEC
2	*Erysimum crassistylum* (Cruciferae)		KP 190.5, 180 m, KP 183.3, 50 m, KP 188, 1507.8m	Very common	Balkan endemic
3	*Platanus orientalis* (Platanaceae)	Oriental Plane	KP 179, 40 m	Sporadic	Protected under PD67/81
4	*Digitalis viridiflora* (Scrophulariaceae)		KP 188, 1507.8 m, out of buffer zone	Rare	Protected (PD67/81)
5	*Bromus cappadocicus* (Gramineae)		KP 190.5, 180m	Rare	Other Important Plant Species list

Source: Compiled by NCC (Asprofos field survey August 2012 and May 2013)

6.3.2.1.6 Filippoi Plain

The Filippoi Plain section covers some 32 km of the proposed pipeline route. This area is comprised of agricultural land with patches of shrubland and only 3 species of interest were identified. The flora taxa of conservational interest found in the Fillippoi Plain section are presented in *Table 6-53*.

Table 6-53 Flora Taxa of Conservation Interest along the Filippoi Plain Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 210, 1080 m, KP 210, 486.6 m, KP 208, 561.8 m	Very common	Annex IV, Directive 92/43/EEC
2	*Dianthus cruentus* (Caryophyllaceae)	Wild carnation	KP 208, 561.8 m	Rare	Other Important Plant Species list
3	*Platanus orientalis* (Platanaceae)	Oriental Plane	KP 194/ 0m,	Sporadic	Protected under PD67/81

Source: Compiled by NCC (Asprofos field survey August 2012 and May 2013)

6.3.2.1.7 Serres Plain

The Serres Plain section covers a section of 90 km along the proposed pipeline route. The area is comprised mainly of agricultural land with patches of shrubland. In total only 3 species of interest were found. *Erysimum crassistylum* was the one found in more sites than the rest (i.e. 5 sites in total).The flora taxa of conservational interest found in the Serres plain section are presented in *Table 6-54.*

Table 6-54 Flora Taxa of Conservation Interest along the Serres Plain Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Erysimum crassistylum* (Cruciferae)		KP 261.7, 110 m, KP 238, 20 m, KP 233.1, 190 m, KP 228, 40 m, KP 227.1, 130 m	Very common	Balkan endemic
2	*Platanus orientalis* (Platanaceae)	Oriental Plane	KP 237, 0 m, KP 238, 0 m	Sporadic	Protected under PD67/81
3	*Hypericum rumeliacum* (Guttiferae)		KP 233.1, 190 m	Rare	Other Important Plant Species list

Source: Compiled by NCC (Asprofos field survey August 2012 and May 2013)

6.3.2.1.8 Kroussia Mountains

This 33 km section is characterized by the presence of extensive oak forests as well as evergreen shrubland and meadows covering the hilly areas at Kroussia Mountains. Beech forest is also found locally. Here a total of 12 different species of interest were found. The flora taxa of conservational interest found in the Kroussia Mountains slopes section are presented in *Table 6-55.*

Table 6-55 Flora Taxa of Conservation Interest along the Kroussia Mountains Section

Nr.	*Latin name(Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Erysimum crassistylum* (Cruciferae)		KP 319.6, 50 m, KP 317.7, 0 m,	Very common	Balkan endemic
2	*Dianthus cruentus* (Caryophyllaceae)	Wild carnation	KP 305.5, 7194.1 m, KP 305, 8118 m, KP 307.5, 7231.4 m, outside of the buffer zone	Rare	Other Important Plant Species list
3	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	KP 304.5, 200 m, KP 300, 0 m, KP 296.1, 50 m, KP 305.5, 7,194.1 m, KP 307, 6,961.8 m	Very common	Annex IV, Directive 92/43/EEC
4	*Platanus orientalis* (Platanaceae)	Oriental Plane	KP 321, 110 m	Sporadic	Protected under PD67/81
5	*Helleborus odorus* ssp. *cyclophyllus* (Ranunculaceae)	Greek hellebore	KP 317.7, 0 m, KP 306.1, 50 m, KP 305.7, 110 m, KP 308, 6,929.3 m KP 307.5, 7,393.2 m, KP 307, 6,961.8 m	Sporadic	Other Important Plant Species list
6	*Verbascum phoeniceum* ssp. *flavidum* (Scrophulariaceae)		KP 319.6, 50 m, KP 304.8, 70 m, KP 304.5, 200 m, KP 300, 0 m, KP 305.5, 7194.1m	Sporadic	Balkan endemic
7	*Minuartia attica* (Caryophyllaceae)		KP 307.1, 20 m	Sporadic	Balkan endemic
8	*Geocaryum capillifolium* (Umbelliferae)		KP 304.5, 200 m	Sporadic	Balkan endemic
9	*Fritillaria pontica* (Liliaceae)		KP 304.8, 70 m, KP 306.1, 50 m	Rare	Other Important Plant Species list
10	*Centaurea affinis* (Compositae)		KP 307, 6961.8 m, outside of the buffer zone	Rare	Other Important Plant Species list
11	*Anacamptis morio* ssp. *caucasica* (Orchidaceae)	Green-veined Orchid	KP 296.1, 50 m, KP 304.8, 70 m, KP 325.3, out of buffer	Rare	Protected under PD67/81
12	*Ophrys mammosa* (Orchidaceae)	Early spider orchid	KP 328.9, 130 m	Rare	Protected under PD67/81

Source: Compiled by NCC (Asprofos field survey August 2012 and May 2013)

6.3.2.1.9 Gallikos Plain

This Gallikos Plain section covers a section of 30 km along the proposed pipeline route. The area comprises agricultural land with patches of shrubland as well as parts of an industrial character. Within this section 4 species of interest where found. The flora taxa of conservation interest found in the Gallikos plain section are presented in *Table 6-56*.

Table 6-56 Flora Taxa of Conservation Interest along the Galikos Plain Section

Nr.	*Latin name(Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Erysimum crassistylum* (Cruciferae)		KP 347.1, 40 m, KP 348, 77.1 m	Very common	Balkan endemic
2	*Dianthus cruentus* (Caryophyllaceae)	Wild carnation	KP 348, 77.1 m	Rare	Other Important Plant Species list
3	*Dianthus stenopetalus* (Caryophyllaceae)	Wild carnation	KP 329.9, 0 m	Rare	Other Important Plant Species list
4	*Ophrys mammosa* (Orchidaceae)	Early spider orchid	KP 329.9, 0 m	Rare	Protected under PD67/81

Source: Compiled by NCC (Asprofos field survey August 2012 and May 2013)

6.3.2.1.10 Axios Plain

The Axios Plain section covers a total of 65 km along the proposed pipeline route. According to the literature review it can be concluded that Axios Plain, mainly covered by agricultural and urban areas, is rather unlikely to host rare or threatened species (Berg et al., 1994; Luoto et al., 2002; Engler et al., 2004; Phitos et al., 2009; Kowarik, 2011).

6.3.2.1.11 Vermio Mountain Slopes

The Vermio Mountain section covers some 40 km along the proposed pipeline route. As per the results of the field survey Mount Vermio hosts up to 31 of the total species identified along the route. The majority of taxa of conservation interest recorded were, namely 16 protected, 13 Balkan endemic and 1 rare. The flora taxa of conservation interest found in the Vermio Mountain slopes section are presented in*Table 6-57.*

Table 6-57 Flora taxa of Conservation Interest along the Vermio Mountain Slopes Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Achillea holosericea* (Compositae)	-	FH-42 (1 ind., KP 453.8, 199 m)	Rare[24]	Balkan endemic
2	*Anacamptis coriophora(Orchidaceae)*	Bug Orchid	FH-5 (1 ind., KP 438.2, 45 m), FH-29 (27 ind., KP 431.2, 69 m)	Sporadic[25]	Protected under PD67/81
3	*Anacamptis morio(Orchidaceae)*	Green-veined Orchid	FH-77 (8 ind., KP 437.9-103 m),	Sporadic	Protected under PD67/81
4	*Anacamptis pyramidalis(Orchidaceae)*	Pyramidal Orchid	FH-10 (2 ind., KP 433.5, 181 m), FH-12 (4 ind., KP 434.4, outside of buffer zone), FH-28 (1 ind., KP 431.2, 95 m), FH-29 (87 ind., KP 431.2, 69 m), FH-32 (9 ind., KP 447.9, 20 m), FH-40 (2 ind., KP 450.2, 8 m), FH-45 (56 ind., KP 453.8, 78 m), FH-55 (3 ind., KP 429.1, 127 m)	Sporadic	Protected under PD67/81
5	*Anthyllis vulneraria subsp. bulgarica (Leguminosae)*	Kidneyvetch	FH-35 (1 ind., KP 445.5, 5 m), FH-36 (1 ind., KP 445.3, 158 m), FH-42 (1 ind., KP 453.8, 199 m), FH-64 (1 ind., KP 442.3, 4 m), FH-66 (1 ind., KP 442, 82 m)	Sporadic	Balkan endemic
6	*Atropa bella-dona (Solanaceae)*	Belladona	FH-68 (1 ind., KP 435.9, 371 m)		Protected under PD67/81
7	*Centaurea napulifera subsp. Napulifera(Compositae)*	Cornflower	FH-7 (8 ind., KP 438.7-139 m), FH-8 (5 ind., KP 438.8, 34 m), FH-9 (4 ind., KP 433.5, 16 m), FH-10 (6 ind., KP 433.5, 181 m), FH-11 (3 ind., KP 434.5, Outside of buffer zone), FH-14 (1 ind., KP 435.2, Outside of buffer zone), FH-19 (3 ind., KP 443, 62 m), FH-20 (4 ind., KP 442.8, 93 m), FH-38 (4 ind., KP 445, 138 m), FH-64 (4 ind., KP 442.3, 4 m), FH-75 (4 ind., KP 438.7-1 m), FH-195 (KP 436.7, 32 m), FH-199 (KP 439.9, 134 m)	Sporadic	Balkan endemic
8	*Cephalanthera longifolia(Orchidaceae)*	Sword-leaved Helleborine	FH-47 (2 ind., KP 427.4, 1 m), FH-59 (1 ind., KP 430.3, 61 m)	Sporadic	Protected under PD67/81
9	*Cephalanthera rubra(Orchidaceae)*	Red Helleborine	FH-13 (6 ind., KP 435.6, 234 m), FH-62 (1 ind., KP 436.9, 181 m), FH-63 (4 ind., KP 436.8, 194 m), FH-67 (18 ind., KP 436.4, 236 m),	Sporadic	Protected under PD67/81
10	*Epipactis sp.(Orchidaceae)*		FH-7 (3 ind., KP 438.7-139 m), FH-62 (1 ind., KP 436.9, 181 m), FH-63 (10 ind., KP 436.8, 194 m), FH-67 (33 ind., KP 436.4, 236 m)	Sporadic	Protected under PD67/81
11	*Galium oreophilum(Rubiaceae)*	-	FH-22 (1 ind., KP 442.3, 161 m)		Balkan endemic
12	*Himantoglossum caprinum (Orchidaceae)*	Eastern Lizard Orchid	FH-72 (56 ind., KP 425.7, 88 m)	Sporadic	Protected under PD67/81& Annex II EU Habitats Directive

[24] Of small population and/or of narrow biogeographical range.
[25] Appearing singly or at widely scattered localities even though the population may be large.

Nr.	Latin name (Family name)	Common name	Recorded populations	Anticipated range	Reason of conservation interest
13	*Neottia nidus-avis(Orchidaceae)*	Bird's Nest Orchid	FH-12 (2 ind., KP 434.4, Outside of buffer zone), FH-13 (11 ind., KP 435.6, 234 m), FH-63 (1 ind., KP 436.8, 194 m), FH-67 (4 ind., KP 436.4, 236 m)	Sporadic	Protected under PD67/81
14	*Ophrys apifera(Orchidaceae)*	Bee Orchid	FH-29 (1 ind., KP 431.2, 69 m), FH-32 (12 ind., KP 447.9, 20 m), FH-43 (1 ind., KP 453.8, 186 m), FH-82 (2 ind.,KP 444, 4 m)	Sporadic	Protected under PD67/81
15	*Ophrys scolopax subsp. Cornuta (Orchidaceae)*	Horned Orchid	FH-48 (2 ind., KP 427, 26 m), FH-49 (8 ind., KP 427, 18 m), FH-52 (8 ind., KP 427.9, 15 m),	Sporadic	Protected under PD67/81
16	*Ophrys sphegodes subsp.epirotica(Orchidaceae)*	Early Spider Orchid	FH-37 (1 ind., KP 445.3, 31 m), FH-38 (4 ind., KP 445, 138 m)	Sporadic	Balkan endemic, Protected*
17	*Orchis mascula(Orchidaceae)*	Early Purple Orchid	FH-8 (26 ind., KP 438.8, 34 m)		Protected under PD67/81
18	*Paeonia peregrine(Paeoniaceae)*	-	FH-47 (37 ind., KP 427.4, 1 m), FH-49 (1 ind., KP 427, 18 m), FH-55 (7 ind., KP 429.1, 127 m)	Sporadic	rare
19	*Paronychia macedonica(Caryophyllaceae)*	-	FH-66 (1 ind., KP 442, 82 m)		Balkan endemic
20	*Phlomis samia(Labiatae)*	-	FH-47 (1 ind., KP 427.4, 1 m), FH-50 (1 ind., KP 427, 45 m)		Balkan endemic
21	*Platanthera chlorantha(Orchidaceae)*	Greater Butterfly Orchid	FH-7 (1 ind., KP 438.7,139 m), FH-10 (2 ind., KP 433.5, 181 m), FH-12 (1 ind., KP 434.4, Outside of buffer zone), FH-13 (12 ind., KP 435.6, 234 m), FH-14 (6 ind., KP 435.2, Outside of buffer zone), FH-69 (6 ind., KP 435.9, Outside of buffer zone)	Sporadic	Protected under PD67/81
22	*Platanus orientalis(Platanaceae)*	Oriental Plane	FH-31 (1 ind., KP 448.3, 82 m), FH-81 (1 ind., KP 443.8, 178 m), FH-82 (1 ind., KP 444, 4 m)	Sporadic	Protected under PD67/81
23	*Polygala supina* subsp. *rhodopea* (Polygalaceae)	-	FH-36 (1 ind., KP 445.3, 158 m), FH-201 (KP 451.5, 74 m)		Balkan endemic
24	*Scabiosa tenuis* (Dipsacaceae)	-	FH-46 (1 ind., KP 427.8, 34 m)		Balkan endemic
25	*Scutellaria rupestris* subsp. *adenotricha* (Labiatae)	-	FH-44 (1 ind., KP 453.8, 183 m)	Rare	Balkan endemic, Protected*
26	*Silene atropurpurea* (Caryophyllaceae)	-	FH-195 (KP 436.7, 32 m)		Balkan endemic
27	*Stachys iva* (Labiatae)	-	FH-44 (17 ind., KP 453.8, 183 m)		Balkan endemic
28	*Stachys plumose* (Labiatae)	-	FH-9 (1 ind., KP 433.5, 16 m)		Balkan endemic
29	*Veronica chamaedrys* subsp. *Chamaedryoides* (Scrophulariaceae)	Speedwell	FH-198 (KP 438.8, 219 m)		Greek endemic
30	*Platanthera* sp. (Orchidaceae)		FH-70 (10 ind., KP 435.9, 73m)		Protected under PD67/81
31	*Orchidaceae* unidentified		FH-56 (1 ind., KP 429.7, 22 m)		Protected under PD67/81

Source: ERM field surveys (June 2011 and May 2012)

6.3.2.1.12 Ptolemaida Basin

According to the literature review it can be concluded that Ptolemaida Basin, mainly covered by agricultural and urban areas, is rather unlikely to host rare or threatened species. Regarding the pipeline crossing from the Wildlife Refuge of Kouri, the vegetation and flora are typical of rural areas, without any conservational importance. (Berg et al., 1994; Luoto et al., 2002; Engler et al., 2004; Phitos et al., 2009; Kowarik, 2011).

6.3.2.1.13 Askion Mountain Slopes

In the Askion Mountain Slopes taxa of conservation interest (7 protected and 3 Balkan endemics) were recorded in the montane and subalpine areas near Kleisoura village, which are presented in *Table 6-58*.

Table 6-58 Flora Taxa of Conservation Interest along the Askion Mountain Slopes Section

Nr.	*Latin name (Family name)*	*Common name*	*Recorded populations*	*Anticipated range*	*Reason of conservation interest*
1	*Anacamptis morio(Orchidaceae)*	Green-veined Orchid	FH-96 (1 ind.,KP 492.4, 232 m), FH-99 (1 ind., KP 492.5, 237 m), FH-113 (1 ind., KP 492.7, Out of buffer), FH-117 (11 ind., KP 493.6, 156 m), FH-203 (KP 477.6, 44 m), FH-204 (KP 477.5, 23 m)	Sporadic	Protected under PD67/81
2	*Anacamptis papilionacea(Orchidaceae)*	Butterfly Orchid	FH-113 (1 ind., KP 492.7, Out of buffer)	-	Protected under PD67/81
3	*Anthyllis vulneraria subsp. Bulgarica(Leguminosae)*	Kidney Vetch	FH-117 (1 ind., KP 493.6, 156 m), FH-201 (KP 451.5, 74 m)	Sporadic	Balkan endemic
4	*Dianthus stenopetalus (Caryophyllaceae)*	Carnation	FH-113 (1 ind., KP 492.7, Out of buffer), FH-114 (1 ind., KP 492.8, 127 m)	Sporadic	Balkan endemic
5	*Epipactis sp.*(Orchidaceae)	-	FH-111 (15 ind., KP 493.7, 181 m), FH-118 (2 ind., KP 493.8, 33 m)	Sporadic	Protected under PD67/81
6	Limodorum *abortivum* (Orchidaceae)	Violet Limodore	FH-98 (1 ind., KP 492.4, 91 m)		Protected under PD67/81
7	*Linum hologynum* (Linaceae)	-	FH-113 (1 ind., KP 492.7, Out of buffer)	Rare	Balkan endemic
8	*Neottia nidus-avis*(Orchidaceae)	Bird's Nest Orchid	FH-111 (1 ind., KP 493.7, 181 m), FH-118 (1 ind., KP 493.8, 33 m)	Sporadic	Protected under PD67/81
9	*Platanthera chlorantha*(Orchidaceae)	Greater Butterfly Orchid	FH-98 (2 ind., KP 492.4, 91 m), FH-99 (3 ind., KP 492.5, 237 m), FH-102 (1 ind., KP 494.8, 89 m)	Sporadic	Protected under PD67/81
10	*Orchidaceae unidentified*	-	FH-96 (2 ind., KP 492.4, 232 m), FH-102 (1 ind., KP 494.8, 89 m), FH-103 (1 ind., KP 494.7, 32 m),		Protected under PD67/81

Nr.	Latin name (Family name)	Common name	Recorded populations	Anticipated range	Reason of conservation interest
			FH-109 (7 ind., KP 494.5, 180 m), FH-110 (1 ind., KP 494.4, 193 m), FH-113 (1 ind., KP 492.7, Out of buffer), FH-114 (1 ind., KP 492.8, 127 m), FH-117 (1 ind., KP 493.6, 169 m)		

Source: ERM field surveys (June 2011 and May 2012)

6.3.2.1.14 Kastoria-to-Border Area

The Kastoria to Border section includes some 39 km of the proposed pipeline route. There a total of 9 taxa of conservation interest have been recorded (*Table 6-59*). Among them there are two protected orchids, Cephalanthera rubra and Dactylorhiza saccifera, which were recorded at the crossings of Aliakmonas River near Kastoria.

Table 6-59 Flora Taxa of Conservation Interest along the Kastoria-to-Border Section

Nr.	Latin name (Family name)	Common name	Recorded populations	Anticipated range	Reason of conservation interest
1	*Cephalanthera rubra(Orchidaceae)*	Red Helleborine	FH-125 (1 ind., KP 521.3, 44 m)	Sporadic	Protected under PD67/81
2	*Dactylorhiza saccifera(Orchidaceae)*	-	FH-160 (1 ind., KP 521.4, 21 m), FH-131 (1 ind., KP 532.3, 66 m)	Sporadic	Protected under PD67/81
3	*Dianthus stenopetalus (Caryophyllaceae)*	Carnation	FH-143 (1 ind., KP 542.8, 241 m)	Sporadic	Balkan endemic
4	*Himantoglossum caprinum (Orchidaceae)*	Eastern Lizard Orchid	FH-145 (1 ind., KP 542.9, 33 m)	Sporadic	Protected under PD67/81
5	*Linaria peloponnesiaca (Scrophulariaceae)*	-	FH-145 (1 ind., KP 542.9, 32 m), FH-146 (1 ind., KP 542.9, 84 m)	-	Balkan enedemic
6	*Ophrys scolopax subsp. Cornuta (Orchidaceae)*	Horned Orchid	FH-126 (5 ind., KP 528.1, 202 m), FH-141 (1 ind., Out of buffer)	Sporadic	Protected under PD67/81
7	*Ophrys sphegodes subsp. Epirotica (Orchidaceae)*	Early Spider Orchid	FH-146 (1 ind., KP 542.9, 84 m)	Sporadic	Balkan endemic, Protected under PD67/81
8	*Spiranthes spiralis (Orchidaceae)*	Autumn Lady's-tresses	FH-177 (KP 537.8, 24 m), FH-180 (KP 538.9, 56 m), FH-183 (KP 536.3, 13 m)		Balkan endemic, Protected under PD67/81
9	*Orchidaceae unidentified*	-	FH-152 (8 ind., Out of buffer), FH-153 (40 ind., Out of buffer)		Protected under PD67/81

Source: ERM field surveys (June 2011 and May 2012)

6.3.2.1.15 Abundance of Flora Taxa of Conservation Interest within the Project Area

Taxa of conservation interest are not evenly distributed in the different vegetation types.

Regarding the East Section (from KP 0 to KP 359, approximately), for example, the protected *Platanus orientalis* was exclusively recorded along rivers and rivulets. Some of the important taxa are very common with high abundance in the wider areas (e.g. *Ruscus aculeatus, Helleborus odorus* ssp. *cyclophillous, Verbascum phoeniceum* ssp. *flavidum* were found in the understorey of almost all the oak forests of NE Greece[26]). Finally some of the important species recorded in edges of fields (e.g. *Erysimum crassistylum*), are probably there because they are pioneer species.

Regarding the West Section (from KP 359 to KP 543), the protected orchids *Epipactis sp., Neottia nidus-avis, Cephalanthera rubra* and *Platanthera chlorantha* were exclusively recorded in beech forests, often forming large populations. All other taxa were recorded in oak forests, grasslands and shrubland. In these vegetation types, orchids (except *Ophrys spp*.), were usually locally abundant, e.g. in the grasslands near Kleisoura village (Askion Mountain slopes section). The *Ophrys taxa, Paeonia peregrina* and the Balkan endemics occurred usually in isolated stands of a few individuals.

The results on the abundance of taxa of conservational interest indicate that several of them are expected to be quite common at least along the surveyed sections. In specific:

- For shrublands and grasslands, it is estimated that within the Project area approximately ten to twelve (10-12) individuals belonging any taxa of conservational interest are expected to be found on average within an area of 100 m^2.
- For Pine (*Pinus)* forests within the Project area, approximately six (6) individuals belonging to any taxa of conservation interest are expected to be found on average within 100 m^2
- For Oak (*Quercus)* forest within the Project area approximately seven to ten (7-10) individuals belonging to any taxa of conservational interest are expected to be found on average within an area of 100 m^2.
- For Beech (*Fagus)* forests within the Project area approximately 26 individuals belonging to any taxa of conservational interest are expected to be found on average within 300 m^2.

[26]Fotiadis 2004, Petermann 1999

Table 6-60 presents the complete list and protection status of the flora taxa of conservation status recorded during thefield surveys.

The abundance of taxa of conservation interest in the different vegetation types is given in the following figures (*Figure 6-46* to *Figure 6-52*).

Table 6-60 Summary of Flora Taxa of Conservation Interest recorded within the study area

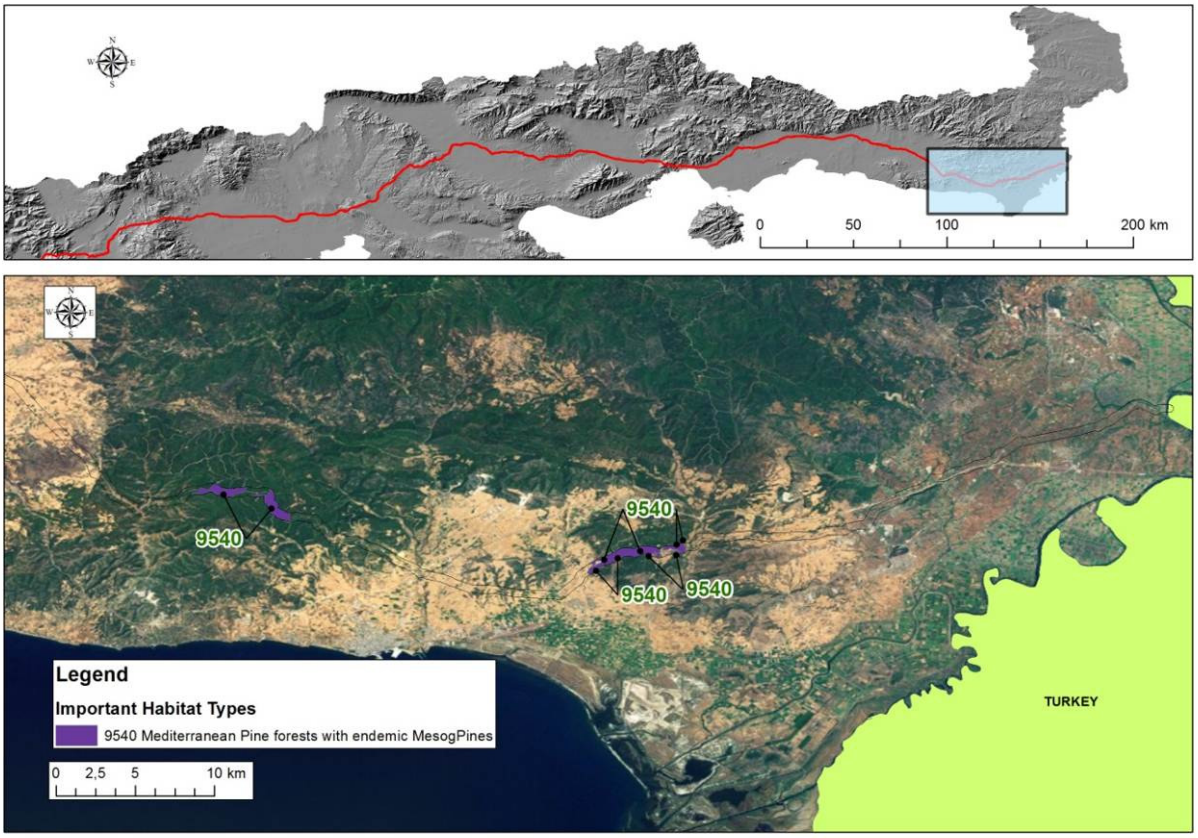
No.	*Latin name*	*Common name*	*Recorded Populations*	*Anticipated range*	*Reason of conservation*
1	*Achillea holosericea*	-	Vermio Mountain	Rare	Balkan endemic
2	*Anacamptis coriophora (Orchidaceae)*	Bug Orchid	Vermio Mountain	Sporadic	Protected under PD67/81
3	*Anacamptis morio (Orchidaceae)*	Green-veined Orchid	Krousia Mountain, Vermio Mountain, Askio Mountain,	Rare - Sporadic	Protected under PD67/81
4	*Anacamptis papilionacea (Orchidaceae)*	Butterfly Orchid	Vermio Mountain, Askio Mountain	Sporadic	Protected under PD67/81
5	*Anthyllis vulneraria subsp. Bulgarica (Leguminosae)*	Kidneyvetch	Vermio Mountain, Askio Mountain	Sporadic	Balkan endemic
6	*Atropa bella-dona (Solanaceae)*	Belladona	Vermio Mountain	-	Protected under PD67/81
7	*Bromus cappadocicus* (Gramineae)		Kavala Mountains	Rare	Other Important Plant Species list
8	*Centaurea affinis* (Compositae)		Kavala Mountains	Rare	Other Important Plant Species list
9	*Centaurea napulifera subsp. Napulifera (Compositae)*	Cornflower	Vermio Mountain	Sporadic	Balkan endemic
10	*Cephalanthera epipactoides* (Orchidaceae)		Southern Evros	Rare	Protected under PD67/81
11	*Cephalanthera longifolia (Orchidaceae)*	Sword-leaved Helleborine	Vermio Mountain	Sporadic	Protected under PD67/81
12	*Cephalanthera rubra (Orchidaceae)*	Red Helleborine	Vermio Mountain, Kastoria to Border	Sporadic	Protected under PD67/81
13	*Cistus ladanifer* (Cistaceae)	Gum cistus	Southern Evros	Rare	Rare in Greece (only in Thrace)
14	Colchicum turcicum (Colchicaceae)		River Evros, Lowlands of Evros	Sporadic	Balkan subendemic
15	*Crocus pulchellus* (Iridaceae)		Southern Evros, Lowlands of Evros,	Sporadic	Balkan subendemic
16	*Dactylorhiza saccifera (Orchidaceae)*	-	Kastoria to border	Sporadic	Protected under PD67/81
17	*Dianthus cruentus* (Caryophyllaceae)	Wild carnation	Filippoi Plain, Kroussia Mountains, Gallikos Plain	Rare	Other Important Plant Species list
18	*Dianthus monadelphus*	Wild carnation	Komotini - Xanthi Plain	Rare	Balkan endemic
19	*Dianthus stenopetalus* (Caryophyllaceae)	Wild carnation	Gallikos Plain, Askio Mountain, Kastoria to Border	Rare - Sporadic	Other Important Plant Species list
20	*Digitalis viridiflora* (Scrophulariaceae)		Kavala Mountains	Rare	Protected under PD67/81
21	*Epipactis sp. (Orchidaceae)*		Vermio Mountain, Askio Mountain	Sporadic	Protected under PD67/81
22	*Epipactis sp.* (Orchidaceae)	-	Askio Mountain	Sporadic	Protected under PD67/81
23	*Erysimum crassistylum* (Cruciferae)		Southern Evros, Komotini - Xanthi Plain, Kavala Mountains, Serres Plain, Kroussia Mountains, Gallikos Plain	Very common	Balkan endemic

No.	Latin name	Common name	Recorded Populations	Anticipated range	Reason of conservation
24	*Fraxinus angustifolia* (Oleaceae)	Narrow-leaved ash	River Evros, Southern Evros, Lowlands of Evros	Sporadic	Other Important Plant Species list
25	*Fritillaria pontica* (Liliaceae)		Kroussia Mountains	Rare	Other Important Plant Species list
26	*Galium oreophilum (Rubiaceae)*	-	Vermio Mountain		Balkan endemic
27	*Geocaryum capillifolium* (Umbelliferae)		Kroussia Mountains	Sporadic	Balkan endemic
28	*Helleborus odorus* ssp. *cyclophyllus* (Ranunculaceae)	Greek hellebore	Kroussia Mountains	Sporadic	Other Important Plant Species list
29	*Himantoglossum caprinum (Orchidaceae)*	Eastern Lizard Orchid	Vermio Mountain	Sporadic	Protected under PD67/81
30	*Hypericum rumeliacum* (Guttiferae)		Serres Plain	Rare	Other Important Plant Species list
31	*Juniperus excelsa* (Cupressaceae)	Greek juniper	Southern Evros	Rare	Protected under PD67/81
32	Limodorum *abortivum* (Orchidaceae)	Violet Limodore	Askio Mountain		Protected under PD67/81
33	*Linaria peloponnesiaca (Scrophulariaceae)*	-	Kastoria to border	-	Balkan endemic
34	*Linum hologynum* (Linaceae)	-	Askio Mountain	Rare	Balkan endemic
35	*Malus trilobata* (Rosacae)	Crab apple	Southern Evros	Rare	Vulnerable (Rare Data Book of Greece)
36	*Minuartia attica* (Caryophyllaceae)		Southern Evros, Komotini - Xanthi Plain	Sporadic	Balkan endemic
37	*Neottia nidus-avis (Orchidaceae)*	Bird's Nest Orchid	Vermio Mountain, Askio Mountain	Sporadic	Protected under PD67/81
38	*Onosma halacsyi* (Boraginaceae)		Southern Evros	Rare	Greek endemic
39	*Ophrys apifera (Orchidaceae)*	Bee Orchid	Vermio Mountain	Sporadic	Protected under PD67/81
40	*Ophrys mammosa* (Orchidaceae)	Early spider orchid	Komotini - Xanthi Plain, Kroussia Mountains, Gallikos Plain	Rare	Protected under PD67/81
41	*Ophrys oestifera* (Orchidaceae)		Southern Evros	Rare	Protected under PD67/81
42	*Ophrys scolopax subsp. Cornuta (Orchidaceae)*	Horned Orchid	Vermio Mountain, Kastoria to border	Sporadic	Protected under PD67/81
43	*Ophrys sphegodes subsp.epirotica (Orchidaceae)*	Early Spider Orchid	Vermio Mountain, Kastoria to border	Sporadic	Balkan endemic, Protected under PD67/81
44	*Orchidaceae unidentified*		Vermio Mountain, Askio Mountain, Kastoria to border		Various protection legislation
45	*Orchis mascula (Orchidaceae)*	Early Purple Orchid	Vermio Mountain		Protected under PD67/81
46	*Orchis purpurea* (Orchidaceae)	Lady orchid	Southern Evros	Sporadic	Protected under PD67/81
47	*Paeonia peregrine (Paeoniaceae)*	-	Vermio Mountain	Sporadic	rare
48	*Paronychia macedonica (Caryophyllaceae)*	-	Vermio Mountain		Balkan endemic
49	*Phlomis samia (Labiatae)*	-	Vermio Mountain		Balkan endemic
50	*Platanthera chlorantha (Orchidaceae)*	Greater Butterfly Orchid	Vermio Mountain, Askio Mountain	Sporadic	Protected under PD67/81
51	*Platanus orientalis* (Platanaceae)	Oriental Plane	Southern Evros, Komotini - Xanthi Plain, Kavala Mountains, Filippoi Plain, Serres Plain, Kroussia Mountains, Vermio Mountain	Sporadic	Protected under PD67/81
52	*Polygala supina subsp. Rhodopea (Polygalaceae)*	-	Vermio Mountain		Balkan endemic

No.	Latin name	Common name	Recorded Populations	Anticipated range	Reason of conservation
53	*Ruscus aculeatus* (Liliaceae)	Butcher's Broom	Southern Evros, Lowlands of Evros, Komotini - Xanthi Plain, Kavala Mountains, Filippoi Plain, Kroussia Mountains	Very common	Annex IV, Directive 92/43/EEC
54	*Satureja pilosa* subsp. *Origanita* (Lamiaceae)		Lowlands of Evros	Rare	Greek endemic, Other Important Plant Species list
55	*Scabiosa tenuis (Dipsacaceae)*	-	Vermio Mountain		Balkan endemic
56	*Scutellaria rupestris subsp. Adenotricha (Labiatae)*	-	Vermio Mountain	Rare	Balkan endemic, Protected under PD67/81
57	*Silene atropurpurea*	-	Vermio Mountain		Balkan endemic
58	*Spiranthes spiralis (Orchidaceae)*	Autumn Lady's-tresses	Southern Evros, Kastoria to border	Rare	Balkan endemic, Protected under PD67/81
59	*Stachys iva (Labiatae)*	-	Vermio Mountain		Balkan endemic
60	*Stachys plumose (Labiatae)*	-	Vermio Mountain		Balkan endemic
61	*Verbascum phoeniceum* ssp. *flavidum* (Scrophulariaceae)		Komotini - Xanthi Plain, Kroussia Mountains	Sporadic	Balkan endemic
62	*Veronica chamaedrys subsp. chamaedryoides*	Speedwell	Vermio Mountain		Greek endemic

Source: Compiled by ASPROFOS (2013)

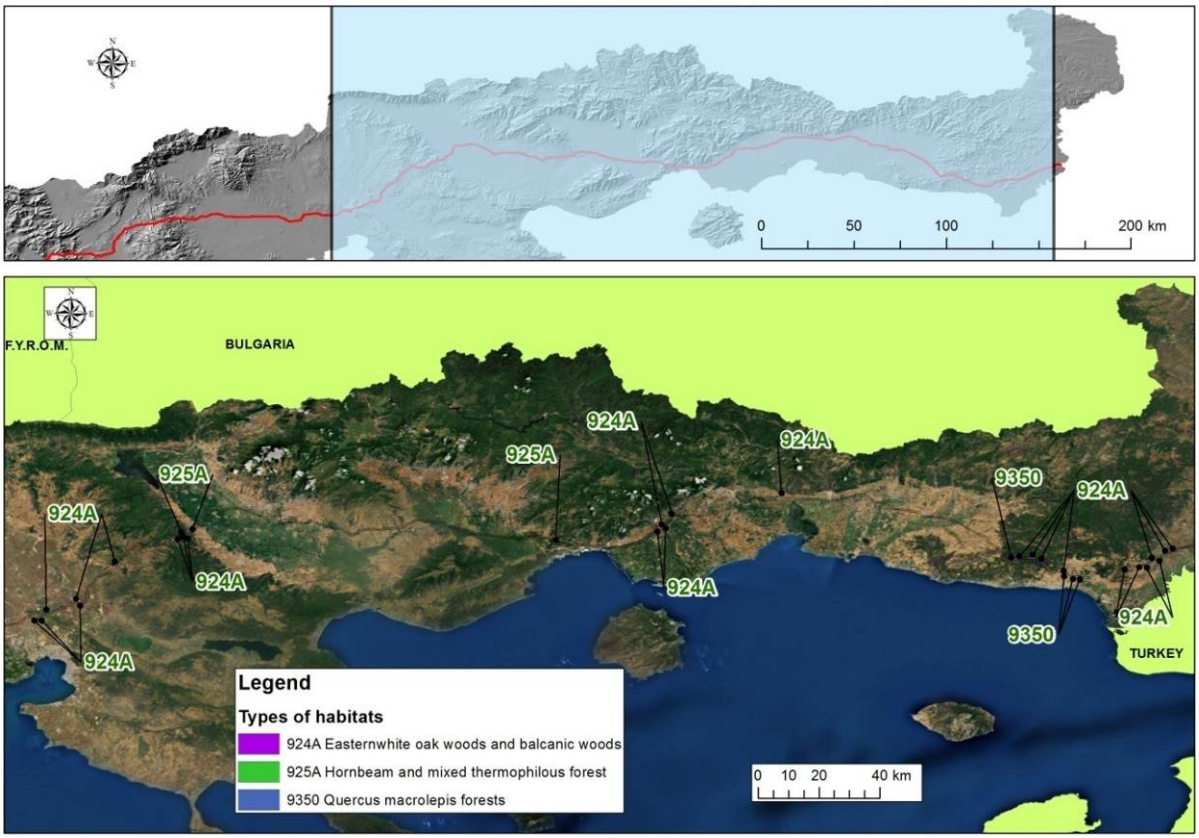
Figure 6-46 Abundance of flora species of interest in Pinus sp. forests (East Sections)



Pine forest: average abundance for taxa of conservation interest per sampling plot (number of individuals)	10.5
95% confidence intervals (number of individuals)	4.32 – 16.68
Taxa of conservation interest found within pine forests:	*Malus trilobata, Onosma halacsyi, Cistus ladanifer*

Source: ASPROFOS field surveys (2013)

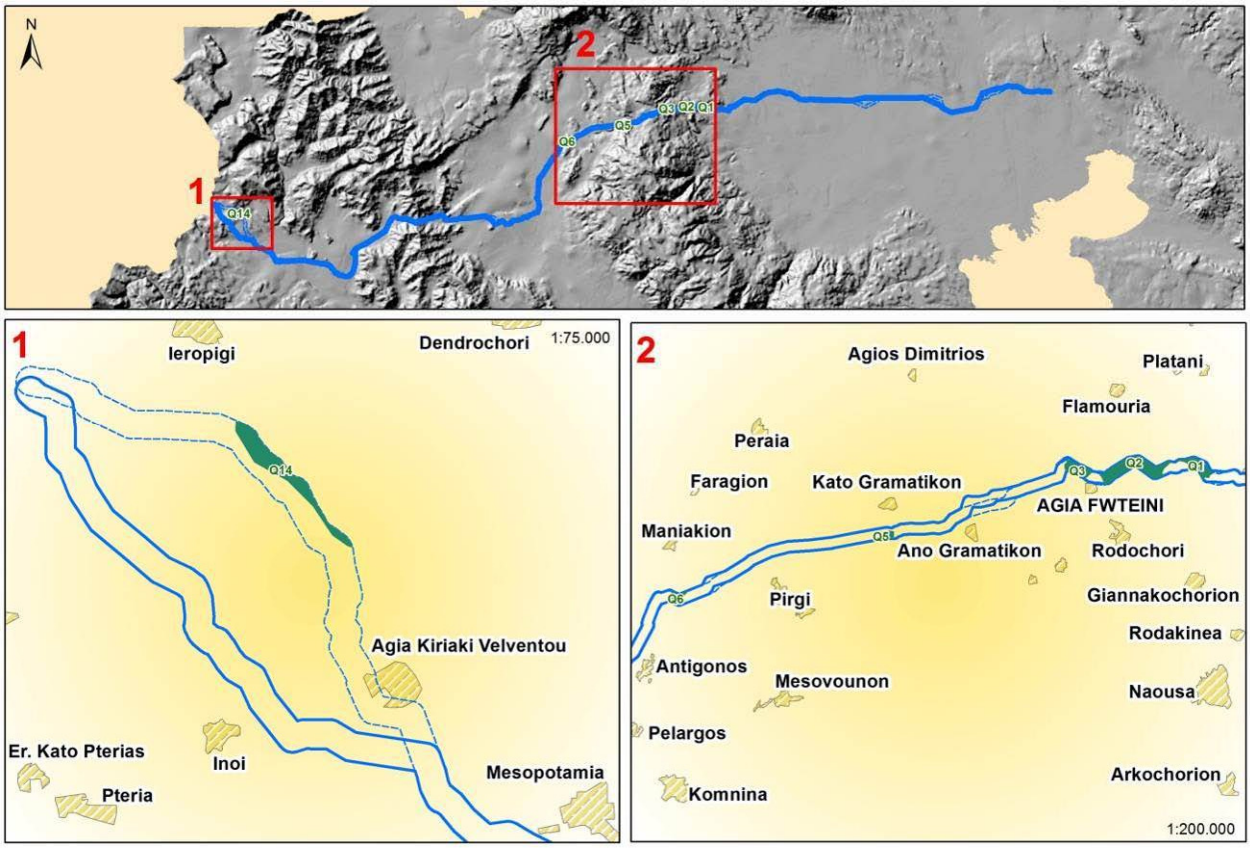
Figure 6-47 Abundance of flora species of interest in *Quercus*sp. forests (East Sections)



Oak forest: average abundance for taxa of conservation interest per sampling plot (number of individuals)	10.94
95% confidence intervals (number of individuals)	4.5 – 17.38
Taxa of conservation interest found within oak forests:	*Cephalanthera epipactoides, Fritillaria pontica, Ruscus aculeatus, Centaurea affinis, Verbascum phoeniceum* ssp. *affinis, Geocaryum capillifolium, Helleborus cyclophyllus* ssp. *odorus*

Source: ASPROFOS field surveys (2013)

Figure 6-48 Abundance of flora species of interest in *Quercus* sp.forests (West Sections)

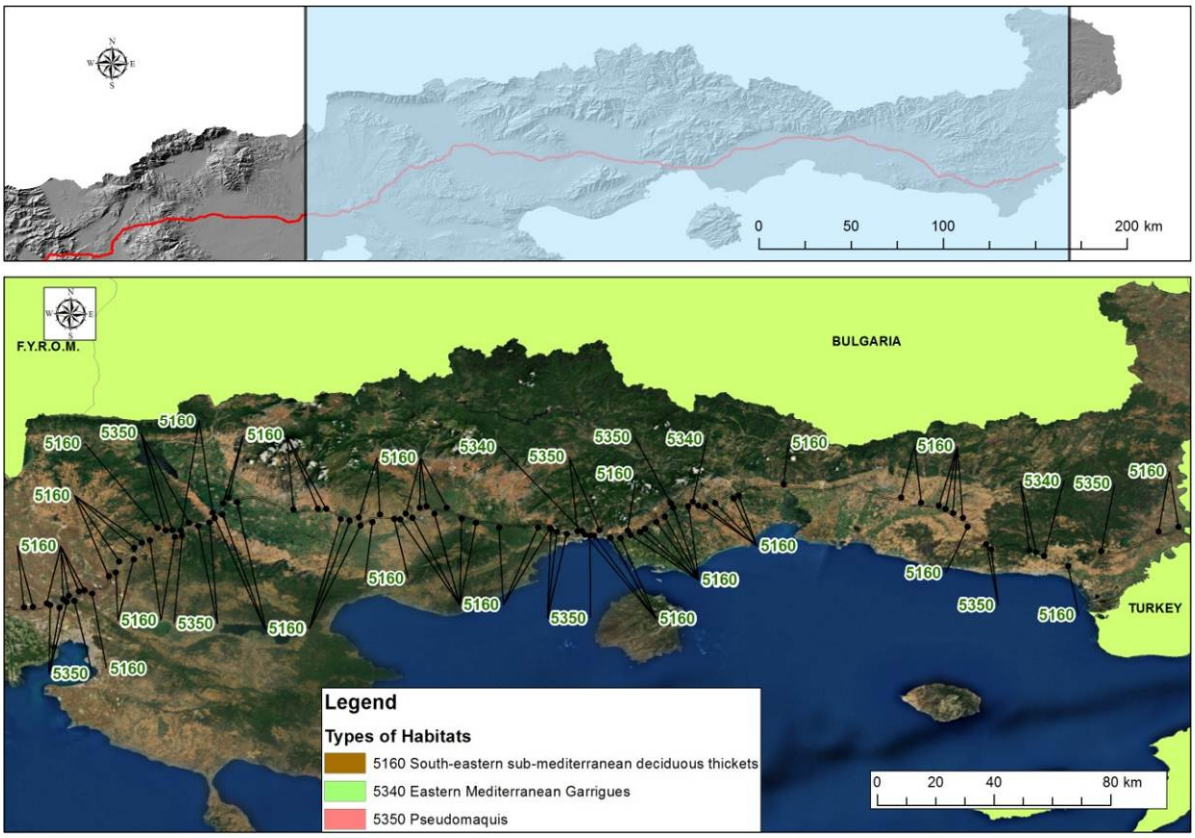


[NB The figure shows the current route as well as the route proposed at the time the field survey took place in June 2011 (dashed line).]

QUERCUS forest: average abundance for taxa of conservation interest per sampling plot (number of individuals)	7.06
95% confidence intervals (number of individuals)	3.56 - 10.56
Taxa of conservation interest found within oak forests:	*Centaurea napulifera* subsp. *napulifera*, *Anacamptis pyramidalis, Neottia nidus – avis, Platanthera chlorantha, Stachys plumosa, Stachys iva, Anthyllis vulneraria* subsp. *bulgarica, Phlomis samia, Scutellaria rupestris* subsp.*adenotricha, Paeonia peregrine, Cephalanthera longipholia, Orchidaceae*

Source: ERM field surveys (June 2011)

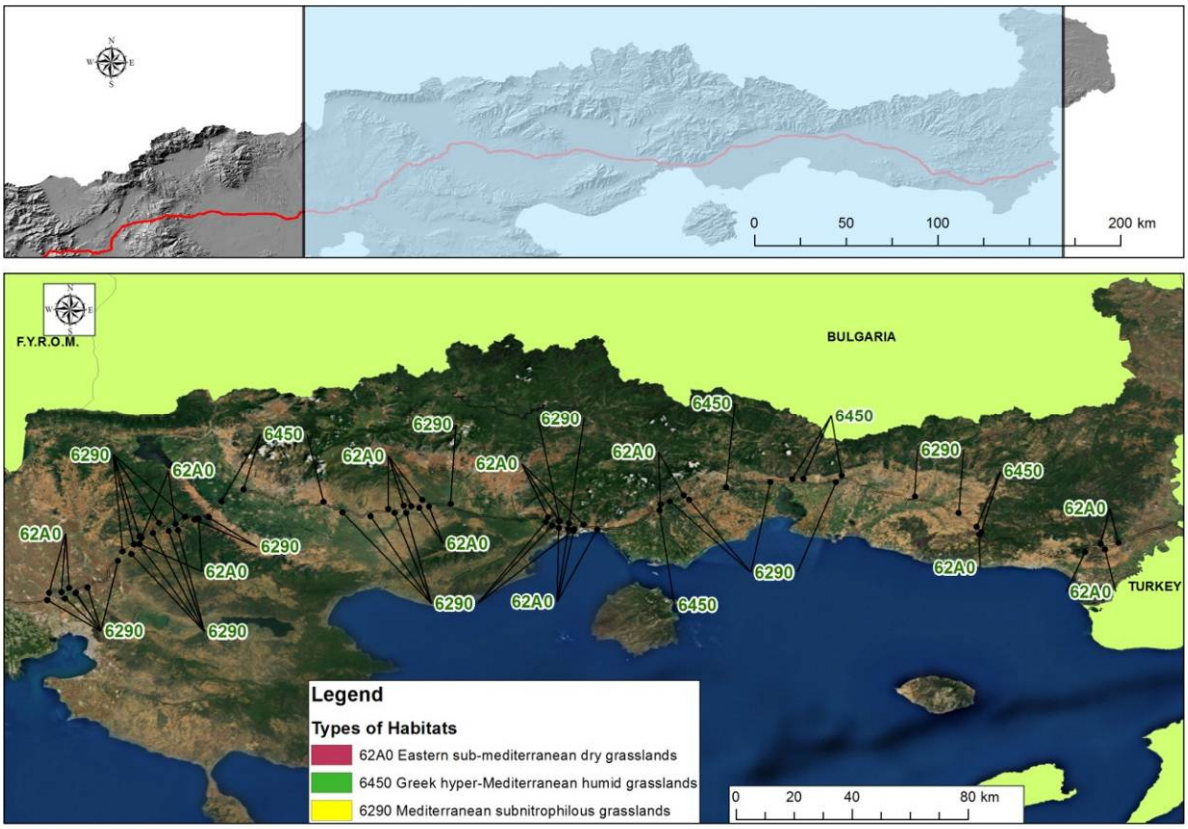
Figure 6-49 Abundance of flora species of interest in shrublands (East Sections)



Shrublands: average abundance for taxa of conservation interest per sampling plot (number of individuals)	12.75
95% confidence intervals (number of individuals)	7.85 – 17.65
Taxa of conservation interest found within shrublands:	*Juniperus excelsa, Orchis purpurea, Ophrys mammosa, Ophrys oestifera, Ruscus aculeatus, Digitalis viridiflora*

Source: ASPROFOS field surveys (2013)

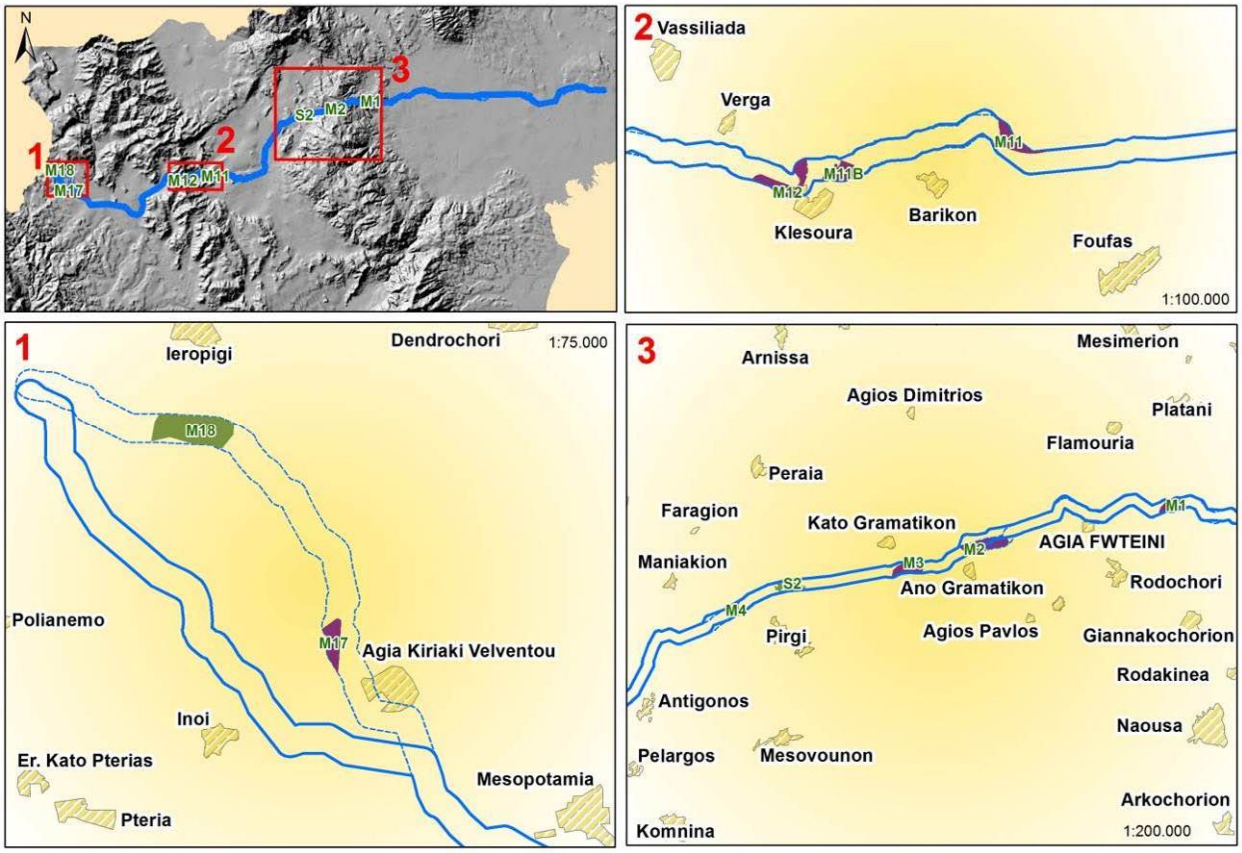
Figure 6-50 Abundance of flora of interest in grasslands (East Sections)



Shrublands: average abundance for taxa of conservation interest per sampling plot (number of individuals)	1.22
95% confidence intervals (number of individuals)	0 – 2.44
Taxa of conservation interest found within grasslands:	*Juniperus excelsa, Orchis purpurea, Ophrys mammosa, Ophrys oestifera, Ruscus aculeatus, Digitalis viridiflora*

Source: ASPROFOS field surveys (2013)

Figure 6-51 Abundance of flora of interest in Grasslands / Shrublands (West Sections)

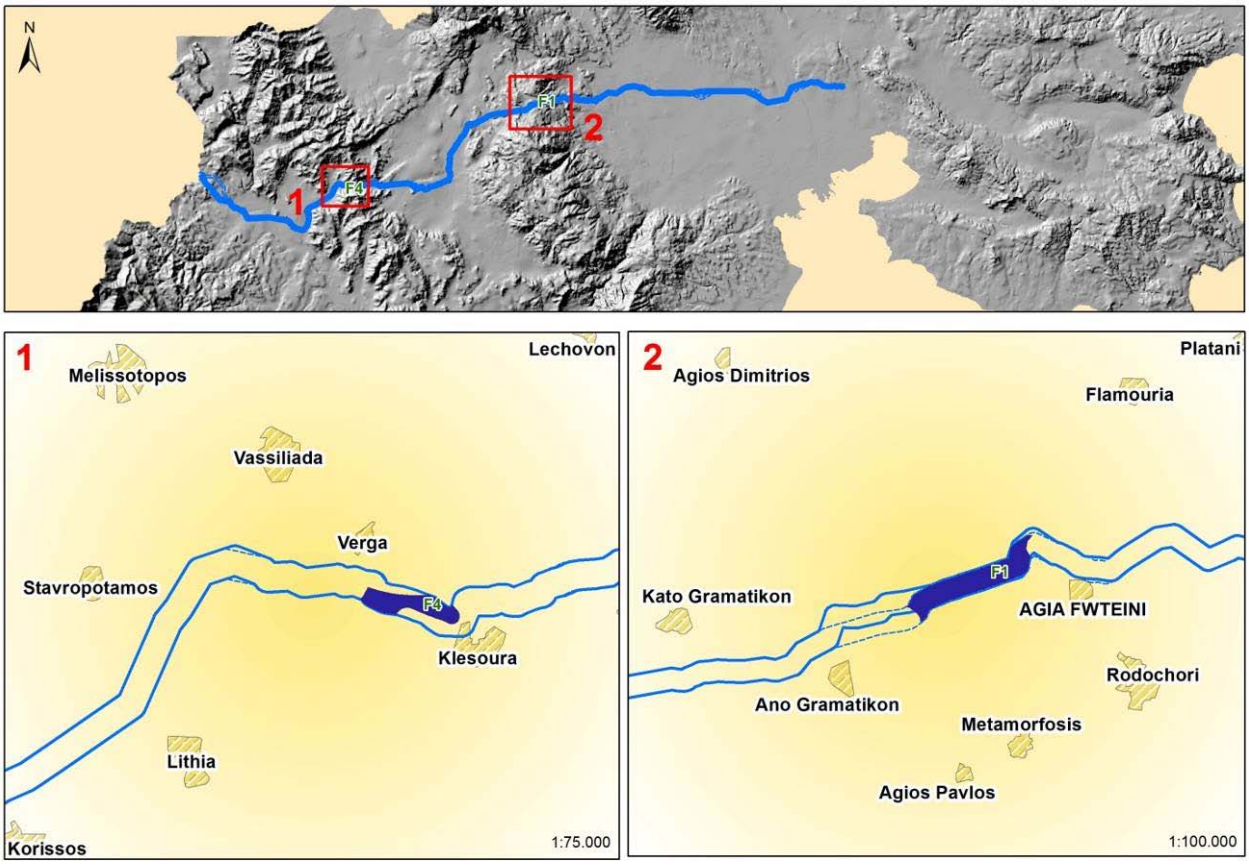


[NB The figure shows the current route as well as the route proposed at the time the field survey took place in June 2011 (dashed line).]

Meadows: average abundance for taxa of conservation interest per sampling plot (Number of individuals)	10.85
95% confidence intervals (number of individuals)	6.35 – 15.35
Taxa of conservation interest found:within grasslands	*Centaurea napulifera subsp. napulifera, Anacamptis pyramidalis, Anacamptis morio, Anthyllis vulneraria subsp. bulgarica, Anacamptis papilionacea, Silene subintegra, Platanthera chlorantha, Cephalanthera longifolia, Epipactis sp, Phlomis samia, Ophrys scolopax subsp. cornuta, Orchis mascula, Paronychia macedonica,* Orchidaceae, *Dianthus stenopetalus, Linum hologynum, Paeonia peregrina*

Source: ERM field surveys (June 2011)

Figure 6-52 Abundance of flora of interest in Beech Forests (West Sections)



[NB The figure shows the current route as well as the route proposed at the time the field survey took place in June 2011 (dashed line).]

FAGUS forest: average abundance for taxa of conservation interest per sampling plot (number of individuals)	26.00
95% confidence intervals (number of individuals)	17.00 – 35.00
Taxa of conservation interest found within beech forests	*Centaurea napulifera* subsp. *napulifera*, *Anacamptis pyramidalis, Neottia nidus – avis, Platanthera chlorantha, Cephalanthera rubra, Epipactis* sp

Source: ERM field surveys (June 2011)

6.3.2.2 Vegetation and Habitats types

The main types of vegetation occurring within the Study Area are: the grasslands, meadows and pasture, forests, which can be further classified as evergreen pine forests, deciduous beech forests and mixed deciduous forests, shrubland communities, riparian vegetation (azonal vegetation and wetlands), and agricultural areas. These types of vegetation are described in detail below along with the habitats of interest with what they are associated. Other types of land cover include reforestations, urbanized areas (settlements, industrial or commercial areas, artificial lands in general) and sparcely vegetated areas, such as calcareous rocky slopes (EU Habitat 8210 *'Calcareous rocky slopes with chasmophytic vegetation')* or unvegetated sand beds.

Vegetation and Habitat types are illustrated in *Annex 4.1 – Habitats and Protected Areas*. More details can be found in *Annex 6.5.1 – Flora and Vegetation Baseline Study*.

6.3.2.2.1 Grasslands, meadows and pastures

Grasslands, meadows and pasture are open areas dominated by herbs, grasses, geophytes and loose scattered trees and shrubs in forest openings, abandoned arable land or above the timberline. Several semi-natural dry grassland communities develop on mountainous and lowland regions of the Study Area, while wet meadows are scattered in openings of forests in the west section of the pipeline route.

Many areas inside Natura 2000 sites and National Parks of Greece have been recorded as grasslands of "Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites) (code 6210)"[27]. This habitat type was never actually occurring in any of the Greek SACs (former SCIs) and is replaced by the non-priority habitat type Eastern sub-mediterranean dry grasslands (Scorzonetalia villosae) (code 62A0). This can be further verified given that 6210* is not included in:

[27]Data used comes from the mapping reports of the project *"Identification and description of the habitat types in areas of interest for nature conservation"* carried out in 2001 from the Ministry of Environment, Land Planning and Public Works (now named Ministry of Environment, Energy and Climate Change). These aged data have never been verified up to now and therefore suffer from partial lack of validation. As a result, some of the identified limits of the habitat types are not accurate when validated in the field and/or some of the habitat types may not exist at all in the designated sites.

- the validated (2011) Standard Data Form that contains information about the habitats (e.g. surface area, representativiness and conservation status) present in the SAC,
- the National Progress Report of the implementation of the Habitats Directive (i.e. report on habitat status) of 2010,
- the national database of the Natura 2000 Network.

The replaced 62A0 habitat type is not a priority listed habitat type.Fieldworkshowed thatlarge grassland areas, which were recorded as the 6210 habitattype,are synanthropic vegetation types, which supports the hypothesis that they do not belong to 62A0, but probably in other Greek habitat types (e.g. 6290 Mediterranean subnitrophilous grasslands).

This type of vegetation includes the following habitat types, encountered along the study area:

- **European habitat 6420 Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion**

Mediterranean humid grasslands of tall grasses and rushes are widespread in the entire Mediterranean basin, extending along the coasts of the Black Sea, particularly in dunal systems.

- **Greek habitat 6290 Mediterranean subnitrophilous grasslands**

This Greek habitat type refers to communities of nitrophilous and synanthropic species. It is usually found in abandoned fields.

- **Greek habitat 62A0 Eastern sub-mediterranean dry grasslands**

This Greek habitat type refers to thermophilous plant communities found in foothills and mountainous areas.

- **Greek habitat 6450 Greek hyper-Mediterranean humid grasslands**

This Greek habitat type refers to communities of nitrophilous and synanthropic species of high humidity. It is usually found in old abandoned fields.

6.3.2.2.2 Coniferous Forests

Coniferous forests are rather large areas with black and Turkish pine (*Pinus nigra, P. halepensis* ssp. *brutia*) plantations have been recorded mostly between KP 345 and KP 353 (Gallikos area), KP 491.9 and 492.9 in the Eordea Plain section near Kleisoura village (Askion Mountain slopes section). In the black pine plantations near Kleisoura (Askion Mountain slopes section) other coniferous species were also observed, such as firs. Plantations of pine species have also been recorded in many hilly areas.

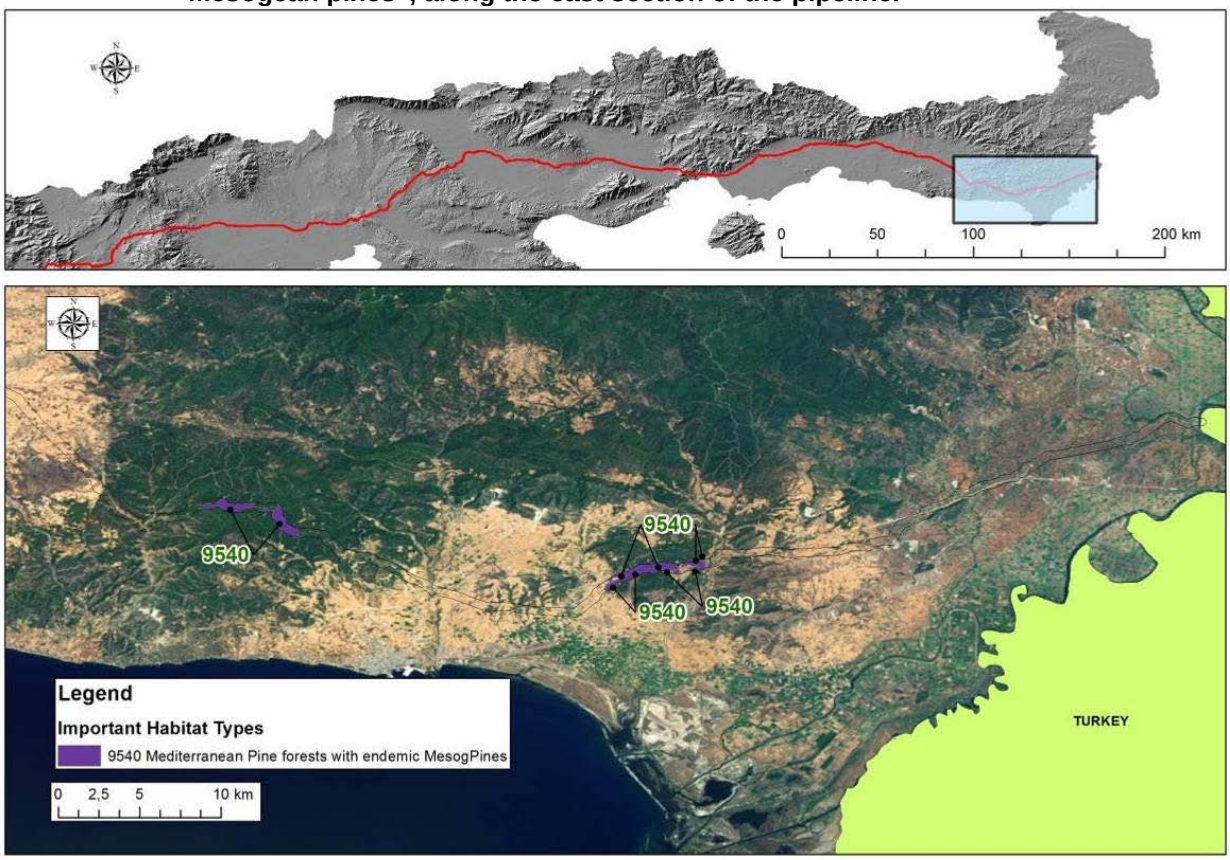
This type of vegetation includes the following habitat type, encountered along the study area:

- **European Habitat 9540 'Mediterranean pine forests with endemic Mesogean pines'**

Mediterranean pine forests with endemic Mesogean pines (*Pinus halepensissubsp. brutia*) along the east section of the pipeline are illustrated in the figure below. Pine forests dominated by *Pinus halepensis* constitute about 9% of the total forest cover in the country (Voulgaris *et al.,* 2010). They are rather widespread in continental and insular Greece, growing on a variety of substrates, from lowland, coastal areas up to 1000 m altitude (Dimopoulos *et al.,* 2012). The main threats they face are forest fires and land conversion for constructions (Dafis *et al.,* 2001, Dimopoulos *et al.,* 2012). Occasionally their stands are expanding locally to neighbouring abandoned fields and pastures (Dimopoulos *et al.,* 2012).

Pinus halepensis forests belong to the European habitat type 9540 "Mediterranean pine forests with endemic Mesogean pines" and occur along the route at the lowland foothills of the Rodopi mountain range and at the hilly areas between Alexnadroupolis and Ferai. They are dominated by *P. halepensis* subsp. *brutia*, pure or in mixed stands with deciduous oaks. The understorey consists of several shrubby species, such as *Erica manipuliflora, E. arborea, Phillyrea latifolia, Juniperus oxycedrus, Arbutus unedo, A. andrachne* and *Cistus* spp. Pine refore stations have also been observed.

Figure 6-53 Occurrence of European habitat 9540 "Mediterranean pine forests with endemic Mesogean pines", along the east section of the pipeline.



Source: NCC (2013)

6.3.2.2.3 Beech (Fagus sylvatica) forests

Beech forest count among the rarest forest types in Greece, providing 5% of the forest cover of the country (Voulgaris et al., 2010). They are restricted in the northern and central mountainous parts of the mainland, at about 800-1700 m and develop on acid, acid to neutral or rarely calcareous substrates (Strid and Tan, 1997; Dafis et al., 2001). The beech forests growing on calcareous substrates are of great importance because they are relatively rare and have a rich understorey with many orchid species (Dafis et al., 2001). Beech forests in Greece are managed by Forest Agencies and do not face severe threats like fires, grazing or illegal felling (Dafis et al., 2001). Five European habitat types of beech forests are found in Greece, differing in floristic composition of the understorey, geological substrate and ecological conditions (Dafis et al., 2001).*Fagus sylvatica* forests along the route occur between KP 433.5 and KP 441.2 in Vermio Mountain slopes section and between KP 492.8 and KP 494.9 in the Eordea Plain near Kleisoura

village (Askion Mountain slopes section). This type of vegetation includes the following habitat type, encountered along the study area:

- **European habitat 9130 *Asperulo-Fagetum* beech forests**

Five European habitat types of beech forests are found in Greece. In the Study area beech forests occur in Vermio Mountain and Eordea plain, where the habitat type "*Asperulo-Fagetum* beech forests" (9130) have been identified, while stands of other beech forest habitat types (e.g. 9110 or 9150) along the route may also occur within 9130 European habitat.

6.3.2.2.4 Deciduous chestnut (*Castanea sativa)* forests

Chestnut *(Castanea sativa)* forests can be also found at Vermio Mountain section (KP 432). In northern and central Greece, chestnut stands are characterized by their high floristic homogeneity, which is reflecte din the identification of only one community per region. Chestnut forests in northern Greece, in particular, exhibit strong floristic similarities with those of the rest of the Balkans[28].

6.3.2.2.5 Deciduous oak (*Quercus spp)* forests

The mixed deciduous forests, chiefly dominated by oak (*Quercus* spp.) species, constitute one of the most common forest types in Greece providing 22.6% of the total forest cover in the country (Voulgaris et al., 2010). They grow at elevations of about 600-1,200 m, on various substrates (flysch, schist, limestone) (Dafis et al., 2001). Especially *Quercus frainetto* forests constitute one third of the Greek forest and 80% of the oak forests (Dafis et al., 2001).

Mixed deciduous forests are the most frequent forest type in the Study Area. Extensive and locally dense forests occur in the area near the Greek-Albanian borders, in the Vermio Mountain, Krousia Mountain and in Evros area. In other areas along the route they form mostly rather small stands among cultivated areas, giving evidence of possibly a former extensive distribution restricted due to human activity. In the area near the borders the oak forest appears in mixed

[28]Konstantinidis, P., Tsiourlis, G., Panteleimon, X., Buckley, G.P., 2008 *Plant Ecology*, V.195, 2, pp 235-256.

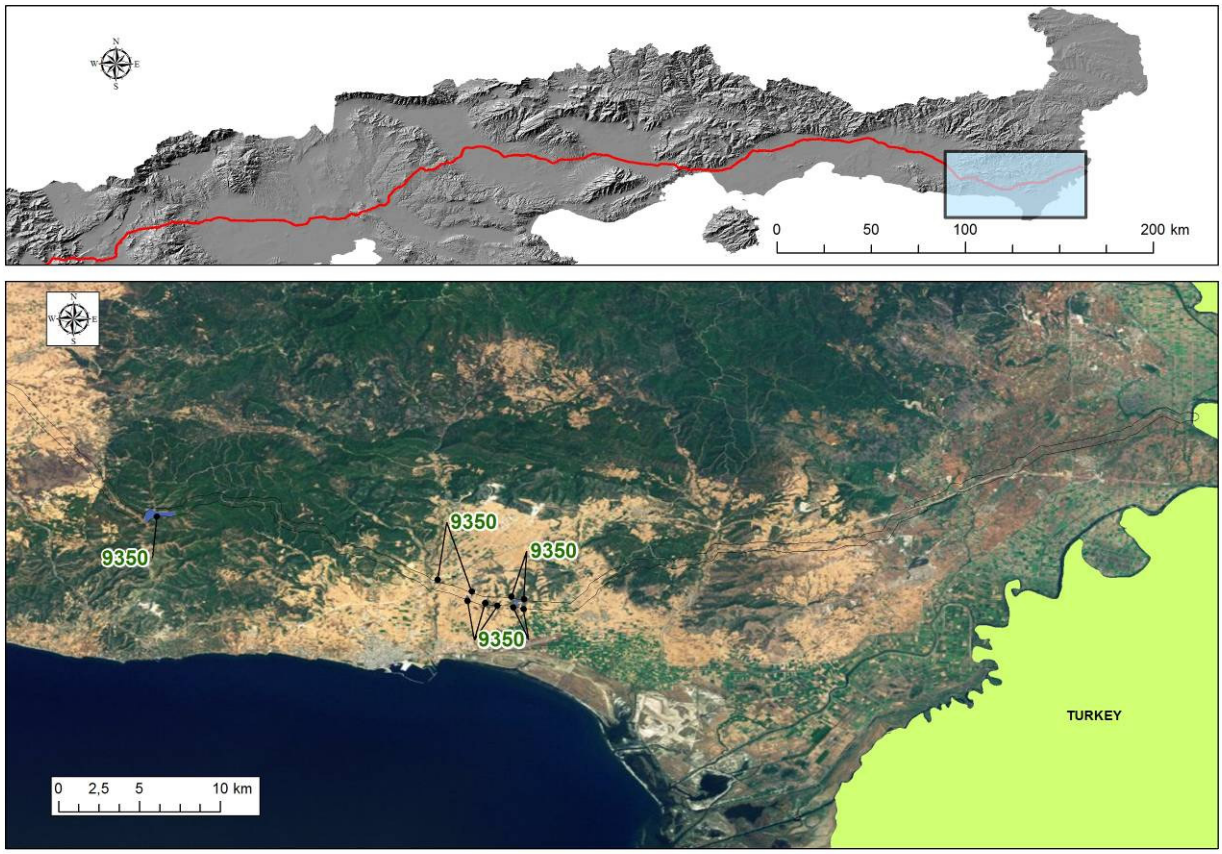
stands with black pine (*Pinus nigra*), the latter often occurs locally with significant cover, while in the area of Evros the relatively rare *Quercus* species, *Quercus ithaburensis,* dominates.
The following habitat types among the deciduous oak forests are found in the project area:

- **European habitat 9350 Quercus macrolepis forests**

This habitat type refers to loose galleries and stands of *Quercus ithaburensis* subsp. *macrolepis* growing on calcareous substrates from the sea level up to 600-700 m in the lowland and semi-mountainous zone of continental and insular Greece (Dafis *et al.,* 2001, Dimopoulos *et al.,* 2012). It has been recorded along the pipeline route south-west of Kirki village as forming loose stands dominated by *Quercus ithaburensis* subsp. *macrolepis* and *Q. pubescens.* Other species that also occur are *Q. coccifera,Pyrus amygdaliformis* and *Juniperus oxycedrus.* The protected autumn-flowering orchid *Spiranthes spiralis* and the Balkan subendemic *Crocus pulchellus* were observed in the *Q. ithaburensis* stands. It should be noted that the total range of this habitat type is rather restricted, occurring in Greece, Albania, S. Italy and W. Turkey (Dimopoulos *et al.,* 2012). In Greece the *Quercus ithaburensis* subsp. *macrolepis* stands are remnants of former extensive forests reduced by human activity (Dafis *et al.,* 2001, Dimopoulos *et al.,* 2012). Thus, they constitute a habitat type that is important and closely monitored in Greece, which is considered primarily responsible for their conservation in the EU (Dimopoulos *et al.,* 2006, 2012).

Occurrence of EU Habitat 9350 '*Quercus macrolepis* forest along the east section of the pipeline is illustrated in *Figure 6-54.*

Figure 6-54 Occurrence of European habitat 9350 "*Quercus macrolepis* forests", along the east section of the pipeline.



Source: NCC (2013)

- **<u>European habitat 9250 Quercus Trojana Woods</u>**

Quercus trojana is one of the rarest oak species in Greece, growing exclusively in the North-western continental part of the country (Boratynski et al., 1992). It forms degraded forests with restricted occurrence within their range in Greece and their conservation is thus necessary (Dafis et al., 2001). They were recorded along the route in mostly loose stands between KP 431.8 and 432.4, KP 445.0 and KP 445.6 and between KP 452.7 and KP 453.5 in the western slopes of Mount Vermio. They form a mosaic with agricultural land and *Juniperus oxycedrus* shrubland, at elevations of about 600-850 m (and up to 1,050 m).

- **<u>Greek habitat 925A Ostrya, Carpinus and mixed thermophilous forests (or Hop-hornbeam, oriental hornbeam and mixed thermophilous forests)</u>**

Hornbeam and mixed thermophilous forest are widespread in Greece; they are not threatened and probably extend to abandoned agricultural areas. It has been recorded along the route in Krousia mountains, in Kavala Mountain and in Mountain Verno, forming dense stands dominated

by several tree and shrub species, such as *Carpinus orientalis, Fraxinus ornus, Acer monspessulanum*.

- **Greek habitat 924A Thermophilous oak woods of E Mediterranean and Balkans (or Balkano-Anatolian Thermophilous [Quercus] Forest)**

Thermophilous oak forests are widespread in Greece (Dimopoulos et al., 2006). Most of them do not face severe threats, however tree felling, conversion to agricultural land and pine afforestations lead locally to reductions of oak stands (Dimopoulos et al., 2012). Well developed, rather extensive oak forest stands in the project area have been observed to the south-west of Kirki village,in Krousia Mountains, in Mountain Vermio, in Mountain Askio and in Kastoria to the border section, while smaller oak forest stands are found among agricultural areas through the route of the pipeline, found as remnants of former extensive oak forests. They are mostly dominated by *Quercus frainetto* and *Quercus pubescens* with other deciduous taxa in the tree layer, some locally dominant, such as *Q. ithaburensis subsp. macrolepis, Q. cerris, Carpinus orientalis*, *Acer monspessulanum, Crataegus sp., Ulmus sp.* etc. Species growing in the understorey are among other *Juniperus oxycedrus, Paliurus spina-christi* and *Cornus mas*. Most of the stands of the Balkan subendemic *Crocus pulchellus* were recorded within the *Q. frainetto* forests south-west of Kirki.

6.3.2.2.6 Shrubland communities

Shrubland communities in the Project area appear in loose stands dominated by *Juniperus oxycedrus*and *Quercus coccifera* mainly in Evros area, in Kavala Mountains, in the western parts of the Vermio Mountain slopes and in section near the Greek-Albanian borders, often forming a mosaic with agricultural land and oak forest stands.Species of conservation interest observed in the shrubland formations along the route are *Satureja pilosa* subsp. *origanita* and *Colchicum turcicum.*

This type of vegetation includes the following habitat types, encountered along the study area:

- **European habitat 5210 Arborescent matorral with *Juniperus spp***

Juniperus formations, occurring in Greece (Dimopoulos *et al.,* 2006), are of high importance due to the protection of soil from erosion and the presence of numerous rare plant species (Dafis *et*

al., 2001). They appear in loose stands dominated by *Juniperus oxycedrus* mainly in the west section of the pipeline route in KP 442.0 - KP 445.7 and in KP 535.9 – KP 537.2, often forming a mosaic with agricultural land and oak forest stands. One protected species (*Spiranthes spiralis*) and several Balkan endemic taxa have been recorded in this habitat, such as *Anthyllis vulneraria* ssp. *bulgarica*.

- **Greek habitat 5160 South-eastern sub-mediterranean deciduous thickets**

This habitat type refers to natural (small areas of high inclination) or semi-natural (in canals between cultivations) hedges found mostly in agricultural areas dominated by *Ulmus campestris, Rubus* spp. Sometimes individuals of *Salix alba, Quercus* spp. and alien invasive species (*Robinia pseudacacia, Ailanthus altissima*) are found.

- **Greek habitat 5340Garrigues of Eastern Mediterranean**

This habitat type refers to shrubby, often low and poor in species formations growing usually in dry, poor soils in continental and insular Greece mostly at low elevations, occasionally up to 1200 m (Dafis *et al.,* 2001). In the project area they form rather dense to very loose stands and are almost exclusively dominated by *Quercus coccifera, Paliurus spina-christi* and other mediteranean species*.* Other sclerophyllous species may co-occur, such as *Juniperus oxycedrus* and *Phillyrea latifolia.*

- **Greek habitat 5350 Pseudomaquis**

This habitat type refers to mixed deciduous and evergreen shrubland formations occurring as a result of degradation of the Ostryo-Carpinion alliance in Greece. It consists of rather tall shrubs, usually dense, with a poor understorey of herbs. In cases of degradation caused by overgrazing or fire, the shrubs are loose and low and may have a richer understorey. In the project area these formations are dominated by several evergreen sclerophyllous and deciduous species such as *Quercus coccifera, Quercus spp.*, *Phillyrea latifolia,Juniperus oxycedrus, Pistacia terebinthus, Carpinus orientalis, Fraxinus ornus, Paliurus spina-christi, Pyrus amygdaliformis* and *Acer monspessulanus.*

6.3.2.2.7 Riparian vegetation (azonal vegetation and wetlands)

In the project area riparian vegetation develops along rivers and streams mostly in loose, restricted and poor stands, while in many cases it is reduced to reedbeds, unvegetated sand beds, or single scattered individuals of riparian species, such as *Salix alba, Platanus orientalis* or *Fraxinus angustifolia*.

Riparian forests and galleries developing along rivers and streams are among the most important vegetation formations in the Study Area. Riparian forests belong to the most threatened habitats in the world, due to human activities and land use in adjacent areas (Fernandes et al., 2011). Activities, such as river impoundment, channelization, drainage, etc. have caused a rapid loss of floodplain forests in Europe, with the willow (*Salix*) and poplar (*Populus*) communities to be the most affected (Wenger et al., 1990). The same applies specifically for Greece (Dafis et al., 2001; Dimopoulos et al., 2005). Riparian forests or galleries along the route develop at the several rivers and streams flowing in the Study Area, such as Axios, Loudias, Kilada, Amyntas, Aliakmonas, Nestos, Kompsatos, Aggitis, Strymonas rivers and several other smaller rivers or rivulets where many times the protected species *Platanus orientalis* dominates.

This type of vegetation includes the following habitat types, encountered along the study area:

- **<u>European habitat 92A0 Salix alba and Populus alba galleries</u>**

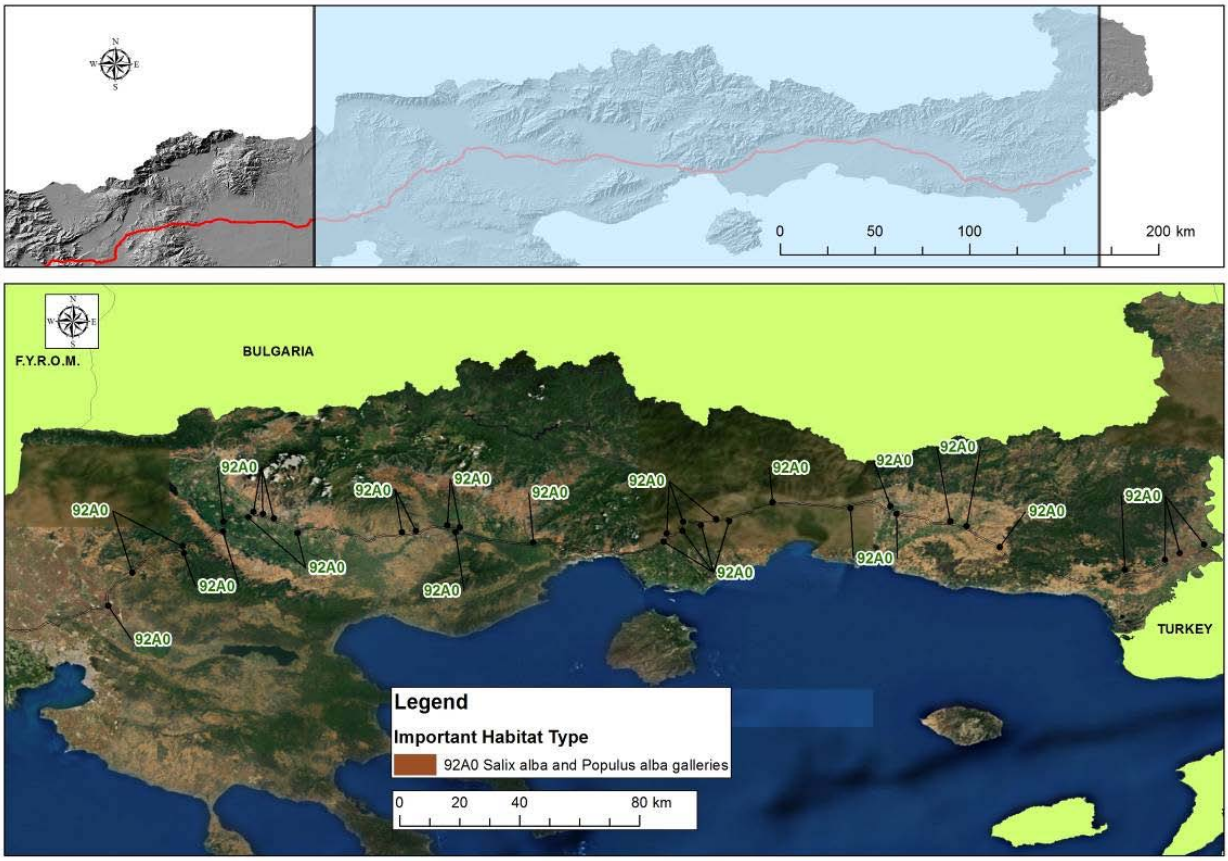
This habitat type refers to the most common riparian forests of the Mediterranean and Central Eurasian region (Zaimes *et al.,* 2010), which have a scattered occurrence in Greece (Dimopoulos *et al.,* 2006). They are dominated by *Salix alba* and *Populus alba,* develop close to the riverbed and are seasonally covered by water (Dafis *et al.,* 2001, EC 2007). Most of the stands (Figure 6-55) are degraded and well-developed *Salix alba* and *Populus alba* galleries occur in KP 0 - 0.5, 77.4, 97.4, 98.6, 136, 153.5-154.1, 157.1, 220, 223.7, 290.1 - 290.5. Riparian species occurring in these galleries are *Salix alba, Populus nigra, P. alba, Fraxinus angustifolia, Alnus glutinosa, Salix amplexicaulis, Platanus orientalis, Cornus sanguinea, Vitex agnus-castus*, etc.

All river and stream crossings all along the pipeline route were thoroughly investigated in order to locate the rare willow species *Salix xanthicola*. This species is a local endemic of Western Thrace and adjacent areas in Bulgaria;however its occurrence seems to be mainly centred further west

and north of the project area (Christensen*et al.,* 2006), as it was not recorded in any of the visited crossings.

Riparian galleries of this habitat type are also present in KP 370.2 to KP 370.6, KP 414.8, KP 468.0, KP 513.0, KP 521.2 to KP 521.6, KP 527.9 and KP 528.1 to KP 528.3. Most extensive stands develop locally along the Axios and Aliakmonas Rivers in species-rich stands with *Populus nigra, Salix eleagnos, S. amplexicaulis, S. purpurea, Alnus glutinosa, Platanus orientalis, Fraxinus angustifolia, Juglans regia, Ulmus glabra, U. minor, Cornus sanguinea, Corylus avellana, Sambucus nigra*etc.

Figure 6-55 Occurrence of European habitat 92A0 "*Salix alba* and *Populus alba* galleries" in eastern section of the pipeline route, along the east section of the pipeline.



Source: NCC (2013)

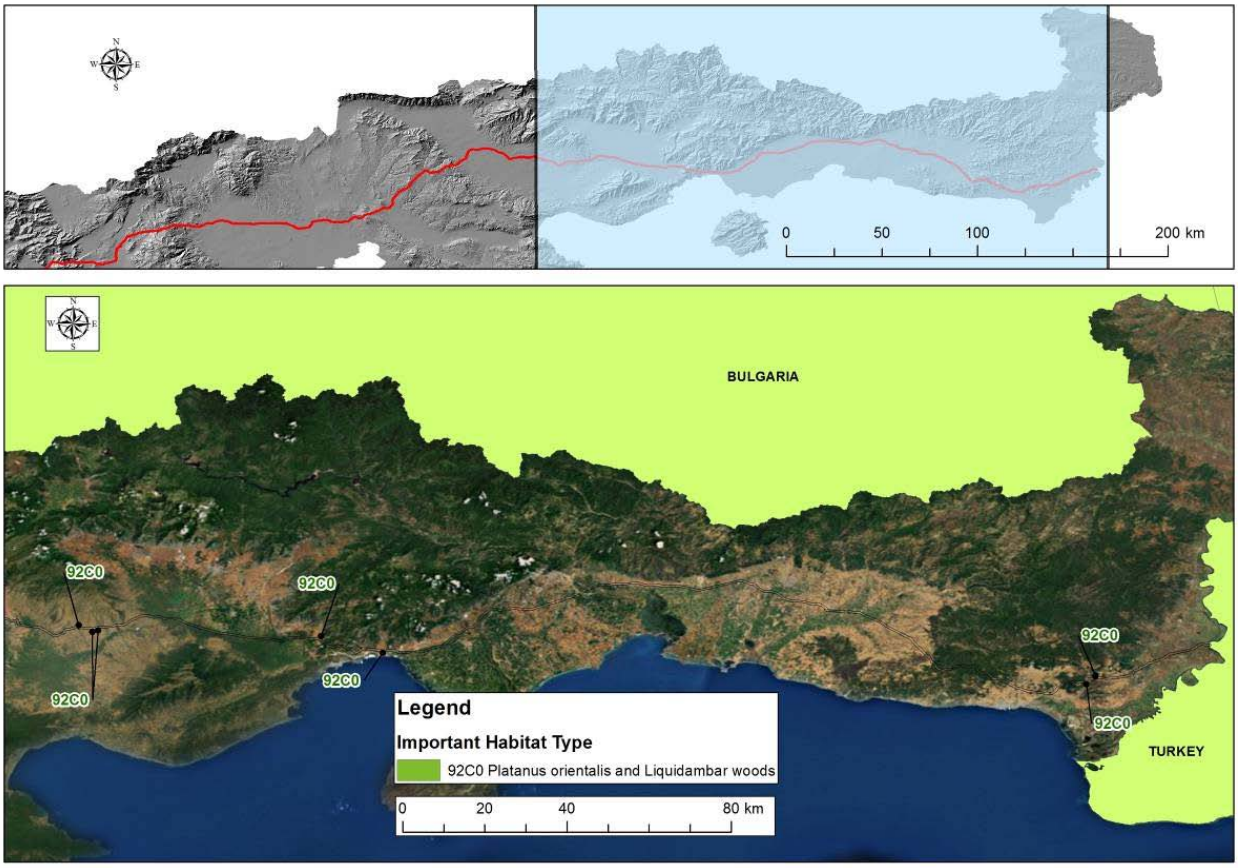
- **<u>European habitat 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)</u>**

This habitat type refers to forests and woods dominated, in continental Greece, by *Platanus orientalis* (oriental plane). They colonise poorly stabilised alluvial deposits of large rivers, gravel

or boulder deposits of permanent or temporary torrents, spring basins, and particularly, the bottom of steep, shady gorges, where they constitute species-rich communities (Dafis *et al.,* 2001; EC 2007). In the project area, from KP 0 to KP 359, extensive *P. orientalis* forests were observed along several rivers and rivulets (see Figure 6-56).*Platanus orientalis* galleries were also found in KP 448 and KP 452 along Grammatiko and Kastro streams in the western part of Vermio Mountain slopes section.

P. orientalis is included in the IUCN Red Data List (LC) and in the "Trees of global conservation concern of UNEP-WCMC".In Greece it is protected by the Presidential Decree 67/81.

Figure 6-56 Occurrence of European habitat 92C0"*Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)", along the east section of the pipeline.



Source: NCC (2013)

- **European habitat 92D0 Southern Riparian Galleries and Thickets (*Nerio-tamaricetea* and *Securinegion tinctoriae*)**

This habitat refers to tree galleries and thicket formations developed at Mediterranean wetlands and streams of permanent or temporary flow dominated by *Nerium oleander, Tamarix* spp. and/or *Vitex agnus-castus* (EC 2007). This type of riparian vegetation does not depend on the permanent flow of water, thus it can develop at drier locations than other riparian habitat types also present in the project area, such as 92A0 or 92C0. They are rather frequent in Greece, both in the continental and insular areas of the country (Dafis *et al*. 2001, Dimopoulos *et al*. 2006). Along the route, they were recorded at Axios Plain (KP 370.2).

- **European habitat 91E0*Alluvial Forests with Alnus Glutinosa and Fraxinus Excelsior (Alno-Padion, Alnion Incanae, Salicion Albae)**

Alluvial forests occur on heavy soils (generally rich in alluvial deposits) periodically inundated by the annual rise of the water level, but otherwise well-drained and aerated during low-water and constitute a European priority habitat (Dafis et al., 2001; EC, 2007). In Greece they occur scattered and are dominated by Alnus glutinosa (Dafis et al., 2001; Dimopoulos et al., 2005).

In the Study Area, alluvial riparian forests were recorded along small streams around KP 498.5 in the Eordea Plain section near Kleisoura (Askion Mountain slopes section) and in KP 525 (90 m away from centreline of the pipeline route) and KP 535 at the Aliakmonas River crossings (Kastoria-to-borders section).

- **European habitat 3170* Mediterranean temporary ponds**

The priority habitat type "*Mediterranean temporary ponds (code 3170)" is found in small patches and stagnant waters of low depth (a few centimetres deep) mostly drying in the summer, which are considered as priority habitat for the European Union. The habitat type was mentioned for the area of Nestos river (during the fieldwork carried out in the present study the habitat type was not recorded) and found in the area of Kompsatos river in very small stands (of areas of 1-2 m^2). The data for Natura site of Nestos river (GR1150010 and GR1150001) gives a cover of the habitat type equal to 0% coverage. It was also found close to the current pipeline route at Vermio (KP 438). However their ephemeral nature and small size regularly create difficulties in terms of their exact delineation, which suggest the need of a pre-construction survey to ensure the precise location of this habitat in the Project area. In any case, the habitat type will not be affected by the construction of the pipeline since Nestos and Kompsatos Rivers are located outside the

construction zone of the proposed pipeline route due to the adoption of a trenchless crossing method on the area where the habitat is potentially present. In the case of Vermio current information places the habitat outside the working strip but pre-construction verification is deemed necessary.

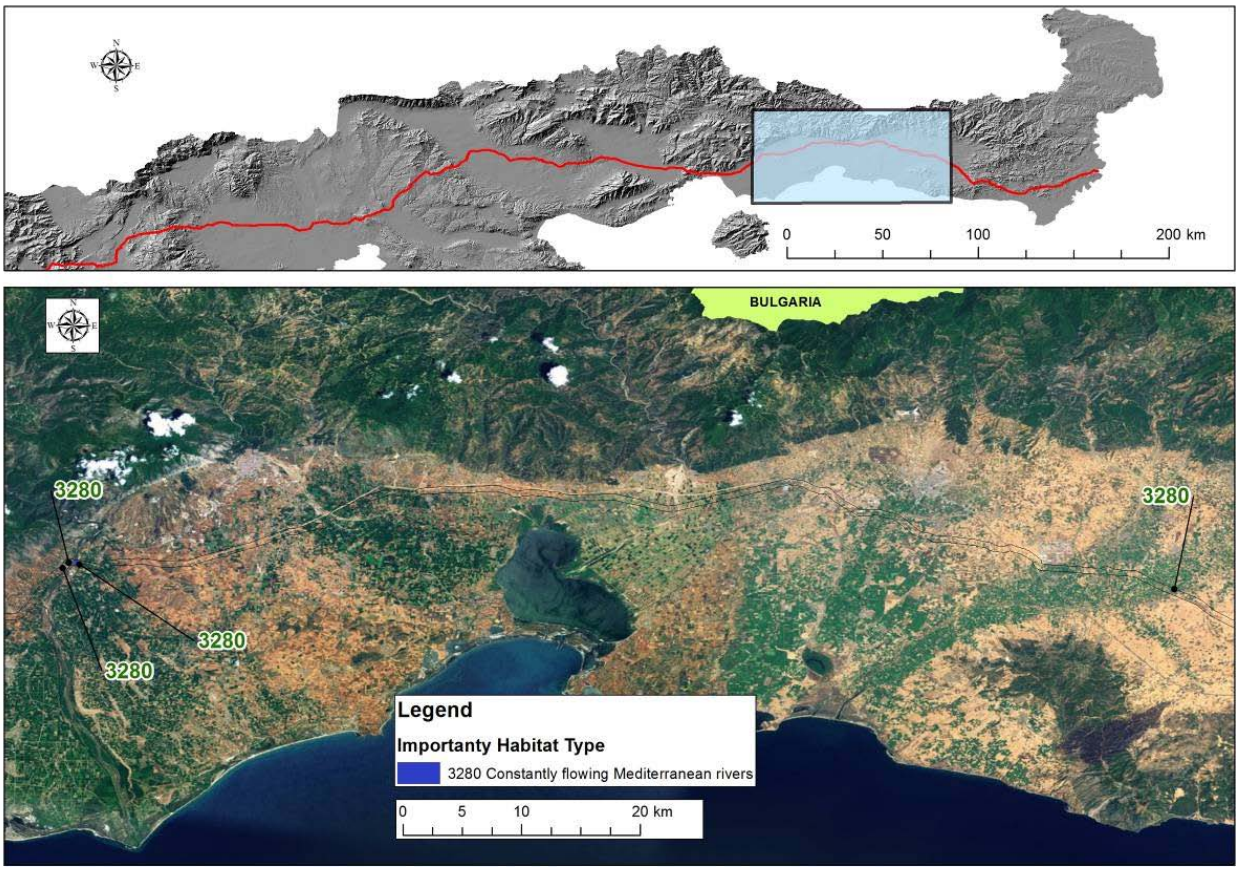
- **European habitat 3190 Lakes of gypsum karst**

These are small permanent lakes that have developed in springs or spring complexes of active gypsum karst areas. These water bodies are characterised by large fluctuations of water level (up to 2.5 m) which is related with the level of the underlying water table and amount of precipitation. Maximum depth of the pools does not exceed 7 m, but the stratification is well-expressed. Typically, they are dominated by *Lemna trisulca, Ceratophyllum demersum*, and *Potamogeton pectinatus*.In the project area they have been recorded in the Southern Evros (KP 23.5),Komotini – Xanthi Plain section (KP 113, KP 136), Kroussia Mountains (KP 303 - 304.5, KP 313, KP 320)

- **European habitat 3280 Constantly Flowing Mediterranean Rivers With *Paspalo-Agrostidion* Species And Hanging Curtains Of *Salix* And *Populus Alba***

This habitat type refers to grass and sedge communities growing along Mediterranean rivers (EC 2007, Dafis *et al.,* 2001). These formations develop at the banks of rivers with temporary or permanent flow, at river islets with sandy or sandy loam soils near banks and, occasionally, they cover large areas at river flood-plains (Dafis *et al.,* 2001). They occur scattered in Greece (Dimopoulos *et al.*, 2006) and are dominated by *Paspalum paspaloides, Rorripa sylvestris, Cyperus fuscus, Persicaria hydropiper, Agrostis stolonifera* and other species (Dafis *et al.,* 2001). In the project area the habitat type has been recorded in the Natura 2000 sites Nestos River (GR1150010 and GR1150001) and Filiouris River (GR1130006) (see Figure 6-57).

Figure 6-57 Occurrence of European habitat 3280 "Constantly flowing Mediterranean rivers with *Paspalo-Agrostidion* species and hanging curtains of *Salix* and*Populus alba*", along the east section of the pipeline.



Source: NCC (2013)

- **Greek habitat 32B0 Annual river communities**

This Greek habitat type refers to communities dominated by annual species in river beds and is found mainly in Komspatos River (KP 113 and KP 136).

- **Greek habitat 72A0 Reed beds**

This habitat type is widespread in Greece (Dafis *et al.,* 2001) and the most common riparian habitat type along the route developing in temporary streams, standing or slow flowing waters dominated by *Phragmites australis* and *Typha* sp.

6.3.2.2.8 Agricultural areas

Extensive agricultural areas occur in the River EvrosArea, Lowland of Evros, Komotini-Xanthi Plain, Philippoi Plain, Serres Plain, Gallikos Plain, Gianitsa Plain (Axios Plain section) and Eordea Plain (Ptolemaida Basin section). Cultivations in the plains include cereals (wheat, barley, maize), rice, cotton, burclover and fruit orchards (cherry, peach, apricot, pear). Hilly cultivated areas, e.g. in Southern Evros, in the western slopes of Mountain Vermio and east of Kastoria, form mostly a mosaic of agricultural land, shrubland and oak forest stands.

The following subsections shortly describe the baseline conditions of vegetation found along the 14 sections of the Study Area, with emphasis on European habitats:

6.3.2.2.9 River Evros

The main vegetation type that occurs in the vicinity of river Evros is cultivations. South-eastern sub-mediterranean deciduous thickets (5160) (KP 1.5 – 2, KP 4, KP 8), Thermophilous oak forests (924A) (KP 10, KP12) and *Salix Alba* and *Populus Alba* galleries (92A0) (KP0 – 2.5, KP 13).

6.3.2.2.10 Southern Evros

In this section of the route, oak forests (*Quercus macrolepis*–9350 and *Thermophilous oak woods of E Mediterranean and Balkans* – 924A), as well as pine forests (9540) are extensively present(several locations between KP 16 and KP 58) in the broader area of the Natura 2000 site SPA GR1110009 ‘Notio Dasiko Symplegma Evrou’ *(Forest Complex of South Evros)*. The understorey consists of several shrubby species, such as *Erica manipuliflora, E. arborea, Phillyrea latifolia, Juniperus oxycedrus, Arbutus unedo, A. andrachne* and *Cistus* spp.

South-eastern sub Mediterranean deciduous thickets (5160) (KP35, KP 36), Pseudomaquis (5350) (KP 25, 59 - 62) and Garrigues of eastern Mediterranean (5340) (KP 43 - 47) cover other non-cultivated areas, where the protected species *Juniperus excelsa* were found. Also in rivers, streams and rivulets *Platanus orientalis* forest were found (Loutros stream, KP 26- 27). At

KP 23.5 an area of Open water – pelagic zone of lakesis recorded.Present in the area are also Eastern sub-mediterranean dry grasslands (62A0) (KP 19, KP 21, KP 22.5, KP 23.5, KP 24.5, KP 27,5 – 28, 62) and Salix alba and Populus alba galleries (92A0) (KP26, KP27).

6.3.2.2.11 Lowlands of Evros

The westernmost part of the route mostly comprises cultivations with cereals (wheat, barley, maize), and with remnants of riparian forest surviving at Filiouris river *(Constantly flowing Mediterranean rivers – 3280)* (KP 77.5) and its tributaries. During the fieldwork areas with *Salix alba-Populus alba* galleries (92A0) (KP 66.5, KP 77, 5, KP 82) were recorded. Also, South-eastern sub-mediterranean deciduous thickets (5160) (KP 70, KP 71-72, KP 77.5, KP 79.5, KP 80.5, KP 85.5), Greek hyper-Mediterranean humid grasslands (KP 62.5), Pseudomaquis (5350) (KP 62.5), Mediterranean subnitrophilous grasslands (6290) (KP 84.5 – 85), and Eastern sub-mediterranean dry grasslands (KP 62.5-63.5, KP 64-64.5) were also recorded.

6.3.2.2.12 Komotini and Xanthi Plain

Komotini and Xanthi Plains consists mainly of arable land with cereals (wheat, barley, maize), interrupted by semi-natural hedges, remnants of riparian forests but also important riparian forests. Field survey showed that the habitat type *Salix alba-Populus alba* galleries (code 92A0, KP 97.4, KP 98.6, KP 136, KP 153.5-154.1, KP 157.1 and had degraded in several other areas), which is listed by the Directive 92/43/EEC, exists along many streamlines that separate agricultural lands and human settlements. Although it is not listed by the Directive as a priority habitat type, its protection is essential as it harbours important species (e.g. *Lemna minor*) and additionally disrupts landscape fragmentation offering communication corridors between maritime and mountainous areas. In the area, the priority habitat type Mediterranean temporary ponds (3170) was recorded in Kompsatos river (KP 112.9) at a distance of 100 m; it is also known to be present in Nestos area (KP 153 – 156), but it was not recorded during the field survey. Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of *Salix* and *Populus alba* (3280) (KP 113, KP 136, KP 153 – 156), Reed beds (72A0) (KP KP 135.9, KP 112.5-113) are included in the European habitats identified in the area. Eastern sub-mediterranean dry grasslands (Scorzonetalia villosae) (62A0), Greek hyper-Mediterranean humid

grasslands (KP 106, KP 117, KP 120, KP 139, KP 158-159.5) and other Greek habitat types were also found. Most of the habitats were found in Hatisio (WR of Hatisio), Komspatos river (Limnes kai Limnothalasses tis Thrakis – Evriteri Periochi kai Paraktia zoni, GR 1130009) and Nestos river (Delta Nestou kai limnothalasses Keramotis – evryteri perioxi kai paraktia zoni, GR 1150010, Delta Nestou kai limnothalasses Keramotis kai nisos Thasopoula GR 1150001).

6.3.2.2.13 Kavala Mountains

The area of Kavala Mountains consists of mainly of evergreen shrublands – pseudomaquis (5350) (along most of the section), South-eastern sub-mediterranean deciduous thickets (5160) (KP 180, KP 183-185, KP 193.5) and garrigues (5340) (KP 182.5-184) dominated by Quercus coccifera, synanthropic vegetation, arable land and some scattered settlements. In addition Mediterranean subnitrophilous grasslands (6290) and Eastern sub-mediterranean humid grasslands (62A0) can be found in several areas. *Quercus trojana* forests (9250) are found (KP 190-191) as well as *Platanus orientalis* forest (92C0) (KP 179).

6.3.2.2.14 Filippoi Plain

Filippoi Plain consists mainly of arable land with cereals (wheat, barley, maize), interrupted by semi-natural hedges. These hedges are dominated by South-eastern sub-mediterranean deciduous thickets (5160) habitats in several areas, Pseudomaquis (5350) (KP 193.5), Eastern sub-mediterranean dry grasslands (62A0) (KP 193) or Mediterranean subnitrophilous grasslands (6290) (KP 193, KP 197, KP 214, KP 220). In addition, remnants of riparian forests exist: field survey showed that the habitat type *Salix alba-Populus alba* galleries (code 92A0), which is listed by the Directive 92/43/EEC (KP 197, KP 201, KP 214, KP 220, KP 224) and reed beds (72A0) (KP 193, KP 197, KP 199, KP 203.5, KP 206, KP 209, KP 214, KP 219) exist along streamlines that separate agricultural lands and human settlements. One stand of *Platanus orientalis* (92C0) was also recorded (KP 193.5).

6.3.2.2.15 Serres Plain

Serres Plain consists mainly of arable land with cereals (wheat, barley, maize), interrupted by semi-natural hedges. These hedges are dominated by South-eastern sub-mediterranean deciduous thickets (5160) and Eastern sub-mediterranean dry grasslands (62A0) habitats in several areas,Pseudomaquis (5350) (KP 233.5, KP 284, KP 295), Mediterranean subnitrophilous grasslands (6290) (KP233, KP 234.5, KP 236 - 237, KP 244-245, KP 252.5, KP 284, KP 295), or Greek hyper-Mediterranean humid grasslands (6450) (KP 238, KP 257.5, KP 281.5, KP 290 – 291). Field survey showed that well developed *Salix alba-Populus alba* galleries (code 92A0, listed by the Directive 92/43/EEC) (KP 232.5, KP 236.5-237, KP 238, KP 266.5, KP 273.5, KP 277, KP 279.5, KP281.5, KP 289, KP 290.1-290.5), exists along Strymonas river and some *Platanus orientalis* stands (KP 237, KP 238, KP 240.5). *Quercus trojana* forest (925A) was also observed in KP 295. Some areas of reforestation were also recorded (KP 233.5, KP 243.5 - 245, KP 290 – 290.5)

6.3.2.2.16 Kroussia Mountains

The pipeline crosses mountainous and hilly landscape with oak forests and kermes oak shrubland where many important species were found (e.g. *Ruscus aculeatus, Fritillaria pontica, Verbascum phoeniceum* ssp. *flavidum*). The northern part of the Koronia-VolviNational park consists of arable land interrupted by semi-natural hedges (remnants of deciduous oak forests or evergreen kermes oak shrublands) and remnants of riparian forests and settlements. The habitat type *Salix alba - Populus alba* galleries (code 92A0), listed into the Annex I of Directive 92/43/EEC, is present in the area but it is very degraded. Specifically, the following habitat types were found:

- South-Eastern Sub-Mediterranean Deciduous Thickets (5160) at KP 303, KP 304, KP 305.5, KP 306, KP 306.5, KP 307, KP 309-309.5, KP 310.5-313, KP 313.5 –320, in several areas, KP 323-329, in several areas
- *Salix Alba* and *Populus Alba* Galleries (92A0) at KP 302.5, KP 303.3, KP 304, KP 304.5, KP 321-321.5
- Lakes of gypsum karst (3190) at KP 303.5, KP 304, KP 304.5, KP 313, KP 320,

- Pseudomaquis (5350) at almost entire study area from KP 295.5 to KP 306.5, KP 307 to 311.5.
- Thermophilous oak woods of E Mediterranean and Balkans (924A), at KP 297 – 298.5, KP 300, KP 321.
- Mediterranean Subnitrophilous Grasslands (6290), at KP 300-301, KP 302-303, KP 305 – 312, in several areas, KP 314, KP 315, KP 317-320, KP 321, KP 321.5, KP 323.5 – KP 329, at almost the entire study area.
- Eastern Sub-Mediterranean Dry Grasslands (62A0), at KP 297.5 – 298.5, KP 304-307, KP 320-321
- *Quercus Trojana* Woods (925A), at KP 295.5 - 297

6.3.2.2.17 Gallikos Plain

Gallikos Plain consists mainly of arable land with cereals (wheat, barley, maize), burclover and fruit orchards (cherry, peach, apricot, pear)interrupted by semi-natural hedges (such as Pseudomaquis – 5350, at KP 346-347, KP 348, KP 349-350, KP 352-354)and remnants and degraded riparian forests (*Salix alba* and *Populus alba* galleries – 92A0, at KP 334.5). Also a *Quercus pubescens* stand was found in the plain (KP 337), as well as Thermophilous oak woods of E Mediterranean and Balkans (924A) (KP 337-339, KP 347, KP 350, KP 352,) while hilly areas covered by degraded evergreen shrublands, dominated by *Quercus coccifera*.

Sparsely vegetated area (Calcareous Rocky Slopes With Chasmophytic Vegetation – 8210) at KP 353.5, South-Eastern Sub-Mediterranean Deciduous Thickets (5160) (KP 329 – 330, 331.5, KP 333, KP 340.5, KP 342-342.5, KP 343.5-344, KP 345 – 347, in several areas, KP 349-350, KP 350.5, KP 355.5, KP 359 – 362.5, in several areas), Mediterranean Tall Humid Herb Grasslands (6420) (KP 345.5, KP 355.5), Mediterranean subnitrophilous grassland (6290) (at KP 342, KP 345-346, KP 347, KP 349.5-350, KP 354.5 – 355.5), and Eastern Sub-Mediterranean Dry Grasslands (62A0) (KP 345.5 – 347, KP 347.5-353, in several areas, KP 354) have also been recorded during the field surveys.

6.3.2.2.18 Axios Plain Section

The main vegetation type that occurs in Axios Plain is the agricultural areas with cereals (wheat, barley, maize), rice, cotton, burclover and fruit orchards (cherry, peach, apricot, pear).
Additionally, the riparian forests develop along the Axios river, while other rivers (e.g. Loudias) and streams flowing in the Giannitsa Plain are usually converted to irrigation channels and are dominated by reeds (*Phragmites australis*). Finally, in the banks of Loudias river, extensive poplar plantations were recorded.

6.3.2.2.19 Vermio Mountain Slopes Section

This area is characterized by rich and variety of vegetation. The most important vegetation types in this area are:

- Grasslands in several areas such as in the north, NW and NE of Ano Grammatiko (KP 437-439), near Pirgi and in the area between Ano Grammatiko and Agia Foteini.
- Deciduous beech (*Fagus* sp.) forest in several areas such as in the north of Ano Grammatiko, in the NW of Agia Foteini and in the area between Ano Grammatiko and Agia Foteini.
- Mixed deciduous forest in several areas such as in the north, NW and NE of Agia Foteini, in the south of Kato Grammatiko, in the NE and NW of Pirgi, in the area between Agia Foteini and Polla nera, in the south of Kato Grammatiko and in the SW of Polla near.
- Shrubland in the south of Kato Grammatiko and NE of Pyrgi.
- River and stream habitats occur in the area of Kastro river crossing and Grammatiko river crossing.
- Agricultural land in the NW of Pirgi.

6.3.2.2.20 Ptolemaida Basin Section

The main vegetation type that occurs in Ptolemaida Basin is the agricultural areas with cereals (wheat, barley, maize), rice, cotton, burclover and fruit orchards (cherry, peach, apricot, pear).

Small patches of grasslands, meadows and pastures have been observed NW of Ptolemaida (KP 478-482).

6.3.2.2.21 Askion Mountain Slopes Section

This area is characterized by varied rich vegetation. The most important vegetation types in this area are:

- Grassland in several areas such as NE of Varikon and in the north and NW of Kleisoura;
- Deciduous beech (Fagus) forest NW of Kleisoura;
- Mixed deciduous forest in several areas such as in the north of Varikon, between Varikon and Kleisoura and in the NW of Kleisoura;
- River and stream habitats in the NW of Kleisoura;
- Coniferous plantation in the north of Kleisoura.

6.3.2.2.22 Kastoria-to-Border Section

Most of the section is dominated by agricultural land, from KP 507 to 535, where the proposed route of the pipeline enters into a hilly area that hosts rich and varied vegetation, such as:

- Grassland west of Agia Kyriaki, in the lower slopes of the rising hills towards the border.
- Mixed deciduous forest in vicinity of the border and in a narrow valley around KP 542.
- Shrubland in the north of Inoi and in the border area;

Additionally some river and stream habitats occur along the Aliakmonas River crossings.

6.3.2.2.23 Summary of Habitats types along the study area

Table 6-61 presents the vegetation types that occur in the Study Area. *Table 6-62* presents the habitats of ecological interest that are crossed by the 38 m woking strip identified along the 14 sections of the Study Area.

Table 6-61 Vegetation types along the study area

Greek Habitat Code	***European Habitat Code***	***Habitat Description***
-	-	Arable land
1030	-	Reforestations
-	-	Settlements
-	-	Unvegetative sand bed
-	3170*	Mediterranean temporary ponds
-	3190	Lakes of gypsum karst (or Open water – pelagic zone of lakes)
32B0	-	Annual river communities
-	3280	Constantly flowing Mediterranean rivers
5160	-	South-eastern sub-mediterranean deciduous thickets
-	5210	Arborescent matorral with *Juniperus spp*.
5340	-	Garrigues of Eastern Mediterranean
5350	-	Pseudomaquis
	6210*	Semi-natural dry grasslands on calcareous substrates (*Festuco-Brometalia)* (* important orchid sites)
6290	-	Mediterranean subnitrophilous grasslands
62A0	-	Eastern sub-mediterranean dry grasslands (*Scorzoneratalia villosae*)
-	6420	Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion
6450	-	Greek hyper-Mediterranean humid grasslands
	72A0	Reed thickets
	8210	Calcareous rocky slopes
-	9130	*Asperulo-Fagetum* beech forests
	91E0*	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Pandion, Alnion incanae, Salicion albae*)
-	92A0	*Salix alba* and *Populus alba* galleries
-	92C0	*Platanus orientalis* and *Liquidambar orientalis* woods (*Plantanion orientalis*)
924A	-	Thermophilous oak woods of Eastern Mediterranean and Balkans
	92D0	Southern riparian galleries and thickets (*nerio-tamaricetea* and *securinegion tinctoriae*)
-	9250	*Quercus trojana* woods
925A	-	Hop-hornbeam, oriental hornbeam and mixed thermophilous forests
-	9350	*Quercus macrolepis* forests
-	9540	Mediterranean pine forests with endemic Mesogean Pines

** European Priority Habitat*

Source: EC (2007); Dafis et al. (2001); Forest Maps 1:200.000; ASPROFOS field surveys (summer 2012, spring 2013); EXERGIA field surveys (October 2012), ERM field surveys (June 2011)

Table 6-62 Identified habitats of interest crossed by the project

Habitat	*Presence within the Project area along the route (pipeline approx. KP)*	*General comments*	*Need consideration/special mitigation measures*
River Evros			
5340	KP 5-6.5, KP 10	Greek habitat	no
72A0	KP 12- 13	Greek habitat	no
92A0	KP 0-0.5	Annex I (92/43 EE)	yes
Southern Evros			
5160	KP 35, KP 36,	Greek habitat	no
5340	KP 42-43, KP 44-46, KP 46,5 - 47,5	Greek habitat	no
5350	KP 58,5 - 62	Greek habitat	no
9350	KP 38, KP 57,5 - 58,5	Annex I (92/43 EE)	yes
9540	KP 27 - 27,5, KP 28,5 - 31,5, KP 49,5 - 51,25, KP 53 - 55,5	Annex I (92/43 EE)	no
62A0	KP 27,5 - 28	Greek habitat	no
924A	KP 16 - 17,5, KP 19, KP 23, KP 24, KP 41,5, KP 47,5 - 49,5, KP 51,5 - 53, KP 55 - 58	Greek habitat	no
92A0	KP 26, KP 27	Annex I (92/43 EE)	yes
92C0	KP 27	Annex I (92/43 EE)	yes
Lowlands of Evros			
3280	KP 77,5	Annex I (92/43 EE)	yes
5160	KP 70, KP 71-72, KP 77,5, KP 79,5, KP 80,5, KP 85,5	Greek habitat	no
5350	KP 62,5	Greek habitat	no
6290	KP 84,5 - 85	Greek habitat	no
6450	KP 62,5	Greek habitat	no
62A0	KP 62,5 - 63,5, KP 64 - 64,5	Greek habitat	no
92A0	KP 66,5, KP 77, 5, KP 82	Annex I (92/43 EE)	yes
Komotini – Xanthi Plain			
3280	KP 113, KP 136, KP 154	Annex I (92/43 EE)	yes
5160	KP 86,5, KP 90,5, and in several hedges from KP 142 - 175	Greek habitat	no
6290	KP 107,5, KP 148, KP 149, KP 155,	Greek habitat	No
6420	KP 171-172,	Annex I (92/43 EE)	No
6450	KP 120, KP 138,5, KP 158-159.5	Greek habitat	no
32B0	KP 112.5-113, KP 135.9	Greek habitat	No
62A0	KP 150	Greek habitat	No
72A0	In several area from KP 104 to KP 109, KP 152,5, KP 159, KP 165,5,	Greek habitat	No
924A	Several areas from KP 158 - 160,5	Greek habitat	No
92A0	KP 97.4, KP 98.6, KP 110, KP 136, KP 142, KP 146, KP 154, KP 158 and degraded in several other areas from KP 161-164.	Annex I (92/43 EE)	Yes
Kavala Mountains			
5160	KP 180, KP 183, KP 193	Greek habitat	no
5340	KP 182.3-184.5	Greek habitat	No
5350	KP 177,5 - 178,5, KP 181-183, KP 186-193,	Greek habitat	No
6290	KP 183, KP 186, KP 187-189, KP 190,5, KP 191-192,	Greek habitat	No
9250	KP 190-191	Annex I (92/43 EE)	Yes
62A0	KP 177,5-178,5, KP 181-182,5, KP 183, KP 184, KP 184,5, KP 186, KP 189 - 190, KP 192,5-193	Greek habitat	No

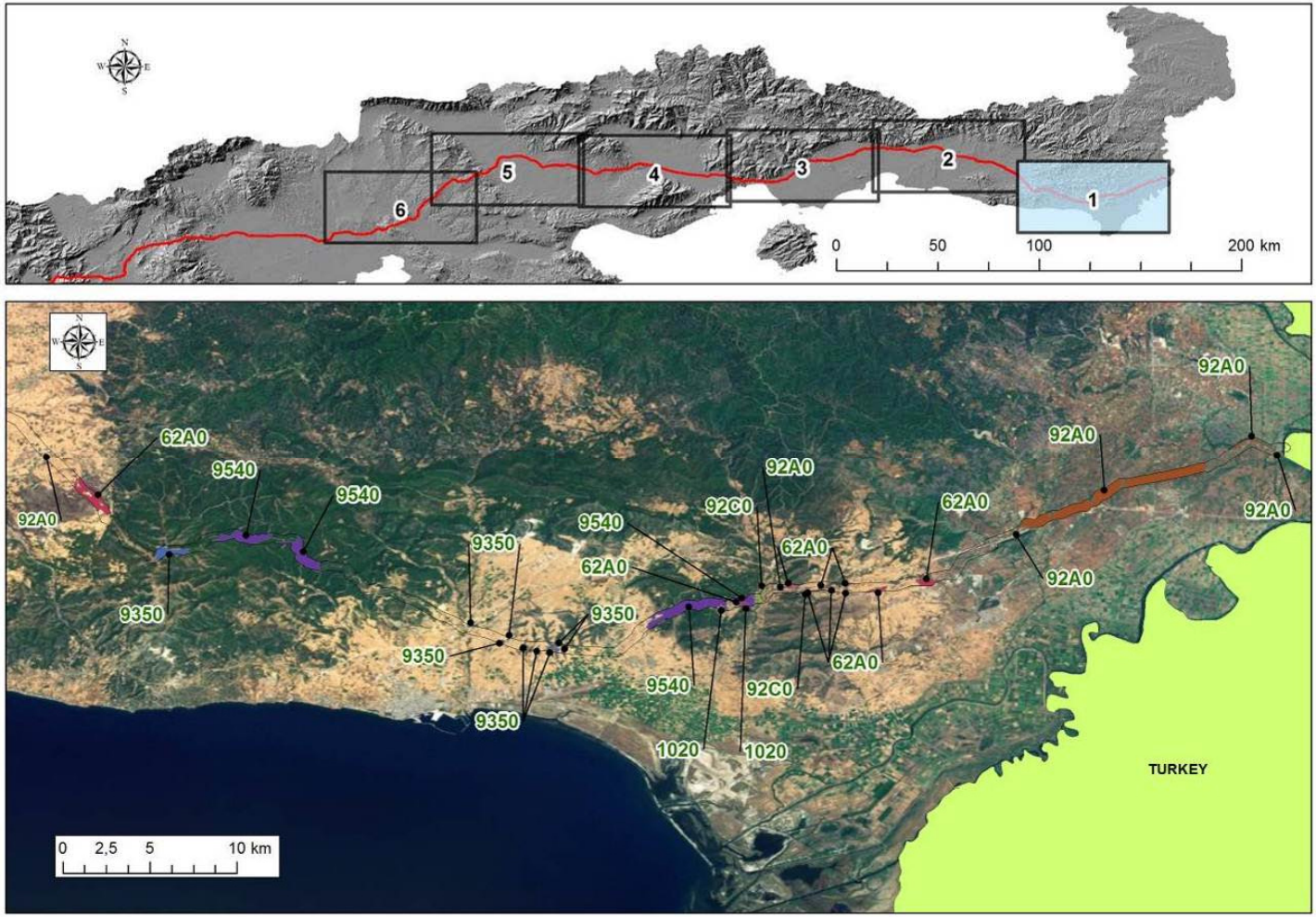
Habitat	***Presence within the Project area along the route (pipeline approx. KP)***	***General comments***	***Need consideration/special mitigation measures***
92C0	KP 179	Annex I (92/43 EE)	Yes
Filippoi Plain			
92A0	KP 197, KP 201, KP 214, KP 220, KP 224	Annex I (92/43 EE)	yes
92C0	KP 193,5	Annex I (92/43 EE)	yes
72A0	KP 193, KP 197, KP 199, KP 203.5, KP 206, KP 209, KP 214, KP 219	Annex I (92/43 EE)	No
6290	KP 220	Greek habitat	No
5160	In several areas	Greek habitat	No
Serres Plain			
1030	KP 233,5, KP 243,5, KP 290-290,5	Greek habitat	no
5160	In several areas	Greek habitat	no
5350	KP 284, KP 295	Greek habitat	no
6290	KP 234,5, KP 236,5, KP 244-245, KP 284	Greek habitat	No
6450	KP 257.5, KP 281.5, KP 290 – KP 291	Greek habitat	no
6450	KP 238, KP 257.5, KP 281.5, KP 290 – 291	Greek habitat	no
62A0	KP 226,5, KP 227,5, KP 228,5, KP 229,5, KP 231,5, KP 238	Greek habitat	No
92A0	KP 232.5, KP 236.5-237, KP 238, KP 266.5, KP 273.5, KP 277, KP 279.5, KP281.5, KP 289, KP 290.1-290.5	Annex I (92/43 EE)	yes
Kroussia Mountains			
3190	KP 304, KP 313, KP 320	Annex I (92/43 EE)	no
5160	KP 303, KP 305.5, KP 306, KP 306.5, KP 307, KP 309.5, KP 310.5-313, KP 313.5 – 320, KP 323-329	Greek habitat	no
5350	KP 295 - 311	Greek habitat	No
6290	KP 300-301, KP 302-302.5, KP 305-307, KP 308.5, KP 310-312, KP 314, KP 315, KP 318-319.5, KP 321.5	Greek habitat	No
62A0	KP 297.5 – 298.5, KP 304-304.5, KP 319, 320-321	Greek habitat	No
924A	KP 297, KP 298, KP 298.5, KP 300	Annex I (92/43 EE)	No
925A	KP 295.5 - 297	Annex I (92/43 EE)	No
92A0	KP 302.5, KP 303.3, KP 304.5, KP 321-321.5	Annex I (92/43 EE)	
Gallikos Plain			
5160	KP 331.5, KP 342, KP 343.5-344, KP 345, KP 345.5, KP 349.5, KP 350, KP 350.5, KP 355.5, KP 359, KP 359.5, KP 360.5, KP 361.3, KP 361.5	Greek habitat	no
5350	KP 346, KP 349, KP 352-354	Greek habitat	No
6290	KP 345.5, KP 355.5, KP 354.5, KP 355.5	Greek habitat	No
6420	KP 345.5, KP 355.5	Annex I (92/43 EE)	No
8210	KP 353.5	Annex I (92/43 EE)	
62A0	KP 345.346, KP 346.5-347, KP 347.5-349.5, KP 350.5, KP 351.5 - 352.5	Greek habitat	No
924A	KP 337-337.5, KP 347	Greek habitat	No
92A0	KP 334.5	Annex I (92/43 EE)	
Axios Plain			
3280	KP 370.1 to KP 370.2	Annex I (92/43 EE)	Yes
92A0	KP 370.2- 370.3, KP 370.5- 370.6, KP 414.8	Annex I (92/43 EE)	Yes

Habitat	*Presence within the Project area along the route (pipeline approx. KP)*	*General comments*	*Need consideration/special mitigation measures*
Vermio Mountain slopes			
5210	KP 442.4 - 442.6, KP 445.0 - 445.1, KP 445.3 - 445.4, KP 445.6 - 445.7	Annex I (92/43 EE)	No
6290	KP 445.1 - 445.2, KP 445.3 - 445.6, KP 447.0 - 447.1, KP 447.4, KP 447.5 - 447.8, KP 448, KP 450.1 - 450.3, KP 451.0 - 451.5, KP 451.7 - 452.0, KP 452.3 - 452.7, KP 453.5 - 453.9, KP 454.1 -454.8	Greek habitat	No
6420	KP 437.0 - 439.0	Annex I (92/43 EE)	No
9130	KP 434.1, KP 434.8 - 437, KP 439.9 - 440.2, KP 440.6 - 441.2	Annex I (92/43 EE)	No
92C0	KP 443.9 to KP 444.0, KP 448.2 - 448.3	Annex I (92/43 EE)	Yes
924A	KP 425.7 - 431.8, KP 432.2 - 433.6 KP 439.0 - 439.9, KP 440.2 - 440.6, KP 442.1 - 442.4, KP 442.6 - 443.1	Greek habitat	No
9250	KP 431.8 to KP 432.4, KP 445.2 - 445.3, KP 452.7 - 453.5	Annex I (92/43 EE)	Yes
Ptolemaida Basin			
-	-		
Askion Mountain slopes			
1030	KP 492.1 - 492.2, KP 492.3 - 492.8	Greek habitat	No
6210	KP 491.6 - 492.1, KP 492.8 - 492.3, KP 492.6 - 493.8	Annex I (92/43 EE)	No
6290	KP 487.2 - 487.8	Greek habitat	No
91E0*	KP 494.7	Priority habitat	Yes
924A	KP 494.8 - 495	Greek habitat	No
Kastoria-to-border area			
5210	KP 535.9 - 537.2	Greek habitat	No
91E0*	KP 532.3	Priority habitat	Yes
924A	KP 537.2 - 543	Greek habitat	No
92A0	KP 513.0, KP 521.3 - 521.4, KP 527.9 and KP 528.1 - 528.3	Annex I (92/43 EE)	no
Note: KP in the table corresponds only to locations falling within the Pipeline Protection Strip			

Source: ASPROFOS, field surveys (summer 2012, spring 2013), ERM field surveys (June 2011 and May 2012)

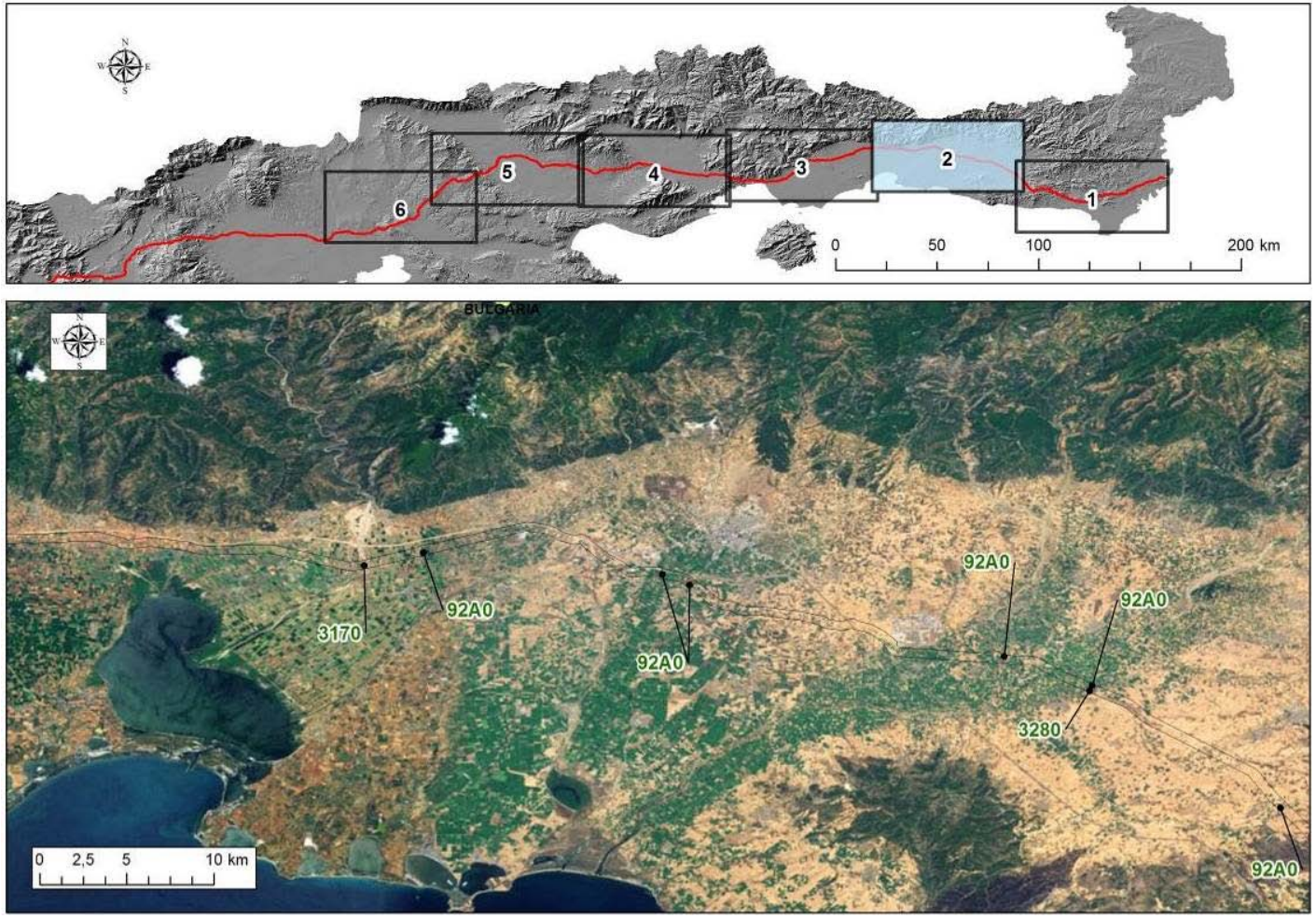
The following figures *(Figure 6-58* to *Figure 6-63*) provide an overview of the EU habitats occurrence along the TAP pipeline.

Figure 6-58 Occurrence of EU habitats along the east section of the pipeline route (1 of 6)



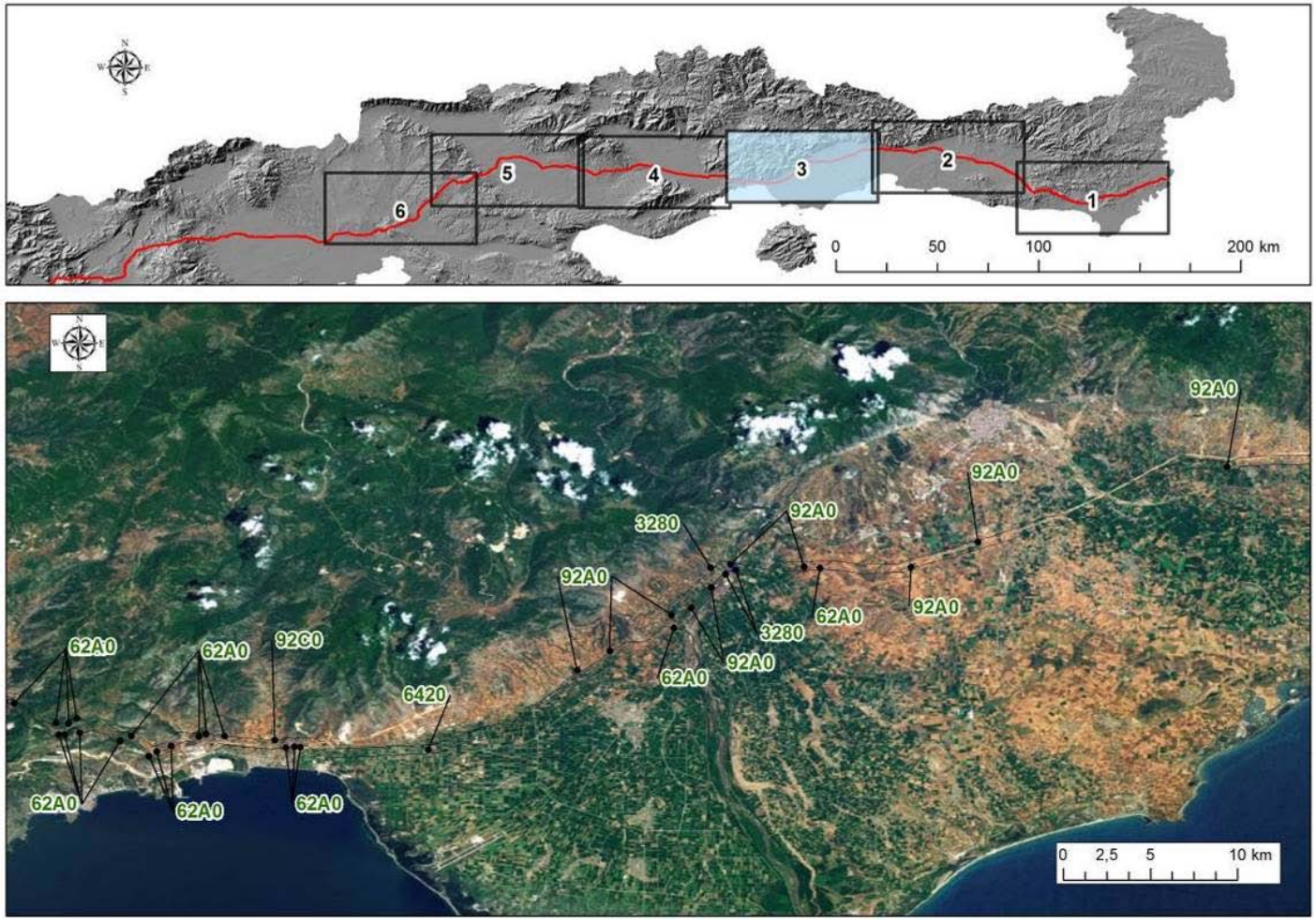
Source: NCC (2013)

Figure 6-59 Occurrence of EU habitats along the east section of the pipeline route (2 of 6)



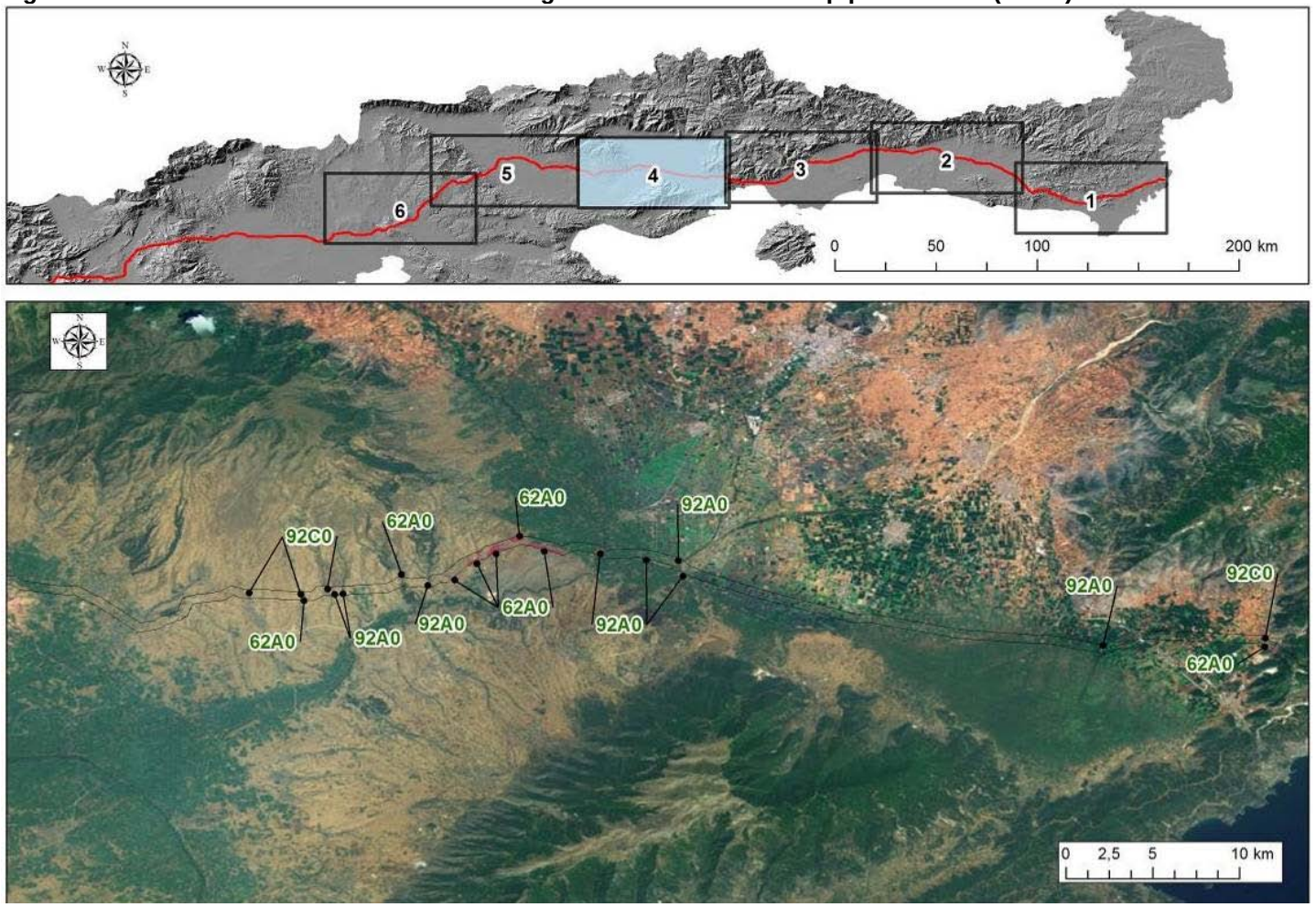
Source: NCC (2013)

Figure 6-60 Occurrence of EU habitats along the east section of the pipeline route (3 of 6)



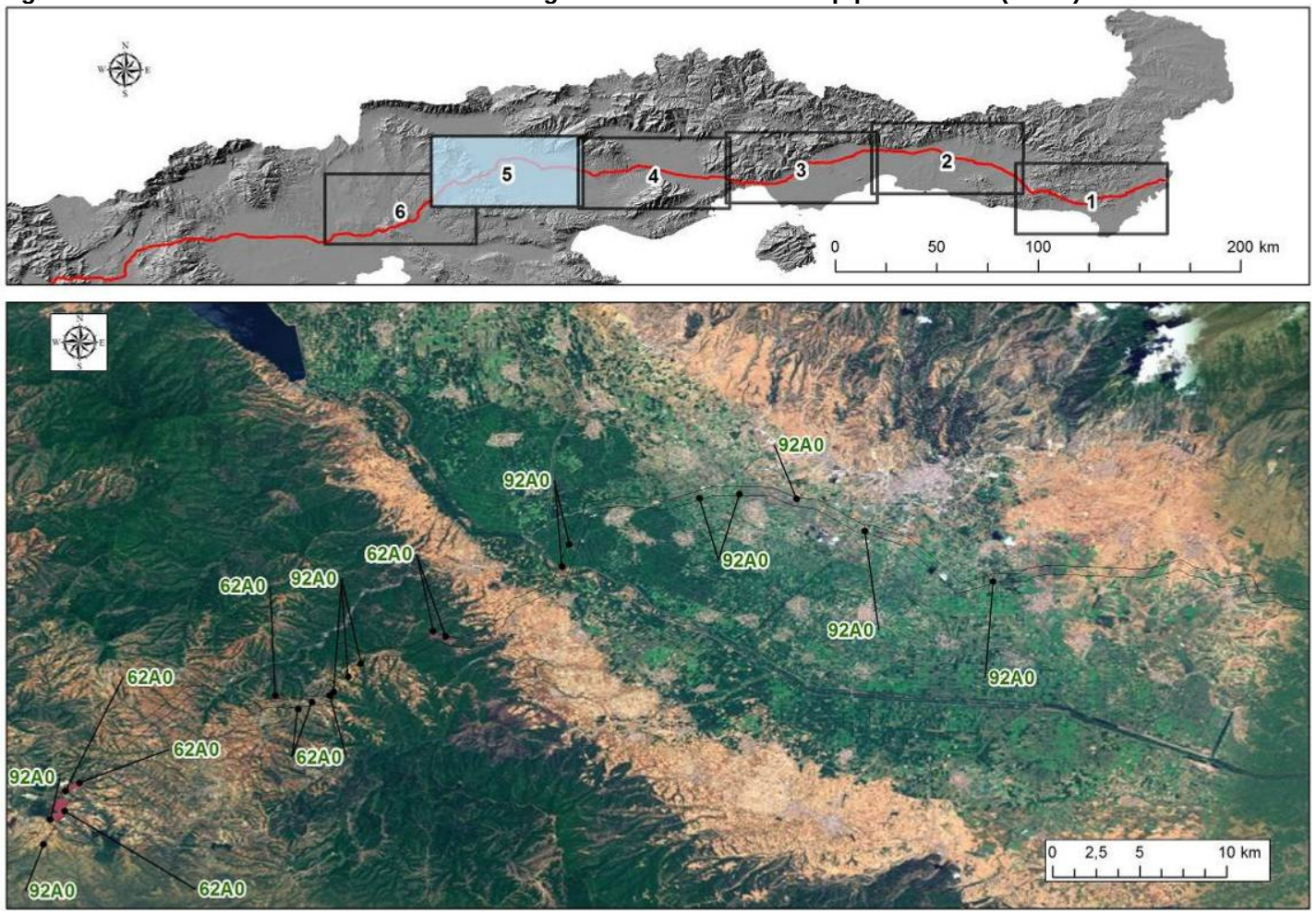
Source: NCC (2013)

Figure 6-61 Occurrence of EU habitats along the east section of the pipeline route (4 of 6)



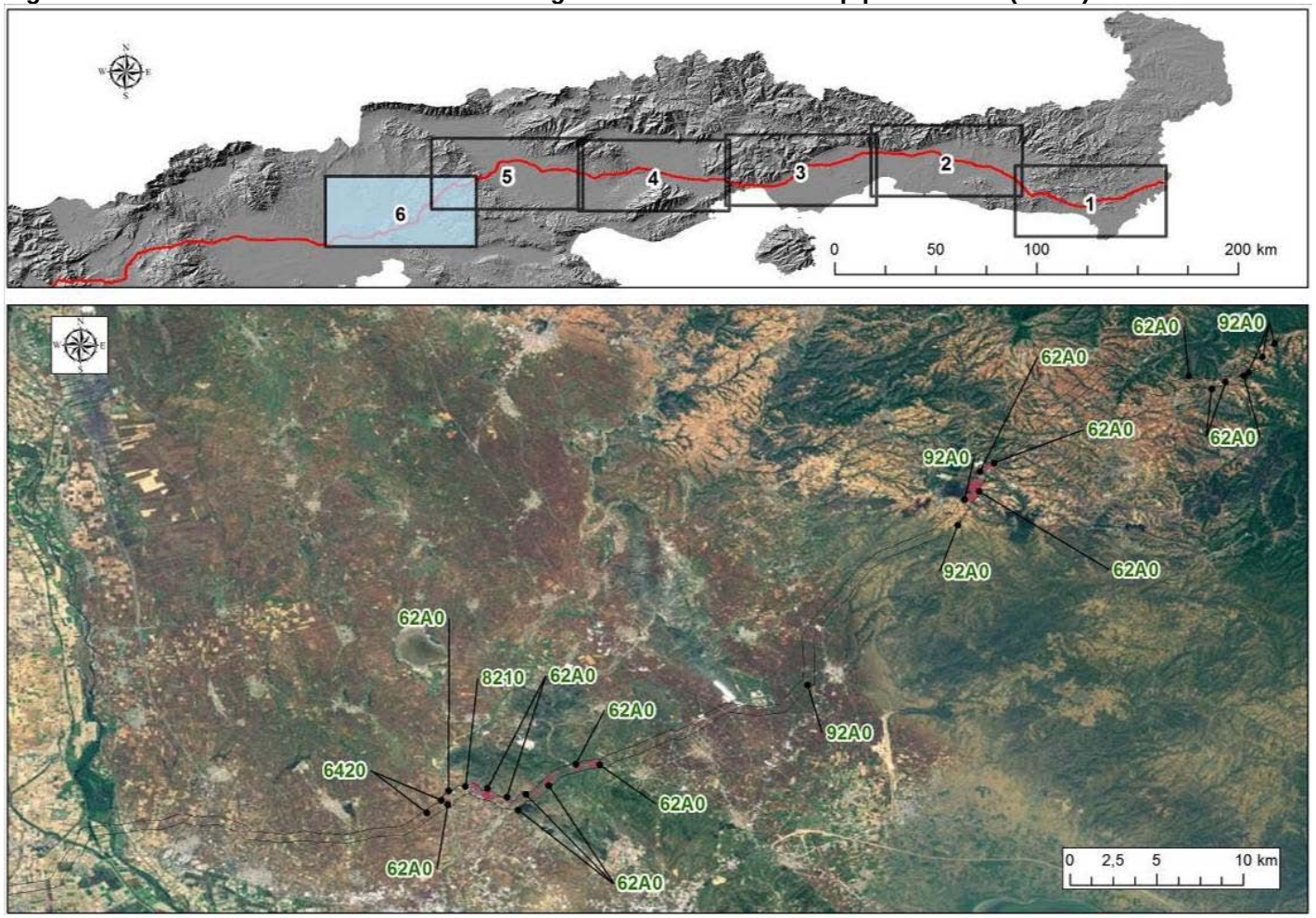
Source: NCC (2013)

Figure 6-62 Occurrence of EU habitats along the east section of the pipeline route (5 of 6)



Source: NCC (2013)

Figure 6-63 Occurrence of EU habitats along the east section of the pipeline route (6 of 6)



Source: NCC (2013)

6.3.3 Fauna

6.3.3.1 Introduction

The east section of the Project region, is mainly comprisedat the lowlands by agricultural land, and by some watercourses with riparian forests, that host distinctive bird species such as the Lesser spotted Eagle (*Aquila pomarina*) and the Black Stork (*Ciconia Nigra*) and mammals like the Jackal*(Canis aureus)* and the European Ground Squirrel (Spermophilus citellus).The west section, includes the largest lake systems in Greece as well as several river valleys with their estuaries, that host mammals species like the Bear (*Ursus arctos*) and bird species like Montagu's Harrier (*Circus pygargus*).

The purpose of this Section is to provide information on the range and abundance of animal species of conservation interest within the Study Area that might be affected by the Project. The sections below present the key fauna baseline findings gathered by combining a comprehensive literature review and the field studies conducted for the fauna of the Study Area[29], which are included in *Annexes 6.5.2 to 6.5.9*.

6.3.3.2 Mammals

The Study Area hosts a wide range of important mammal species such as bear, wolf, jackal, otter, mole, shrew, European ground squirrel, roe deer and wild boar. Based on literature reviews and field surveys performed for the area, a number of these species were selected for more detailed study due to their current conservation and / or protection status. The following section therefore provides detail on the presence, spread and characteristics of bear, jackal, wolf and European ground squirrel populations within the Study Area.

This baseline information is organized per species and according to the defined sections of the base case route (refer to *Table 6-47)*.

[29]No animals were captured or tagged for the purpose of the ESIA.

6.3.3.2.1 Jackal (*Canis aureus*)

The jackal is not considered a priority species for the European Union and therefore it is listed on Annex V of the EU Habitats Directive. It is also assessed a species of Least Concern by the IUCN and listed on Appendix III of CITES, showing a global increasing population trend.

Despite of the above, in the Greek context the species of the golden jackal are estimated to be in decline and the population severely fragmented (Giannatos, 2004) and, differently from other mammal species (e.g. wolfs and foxes), their population is not recovering despite of having been removed from the vermin list in 1990 and the complete ban of the poisoned baits.

Overall, Jackals are relatively adaptable to temporary, short-term disturbances generated by mild construction activities (e.g. low human presence, earthworks and heavy machinery), Nevertheless, wherever these alterations are permanent (or extend over long periods of time) or lead to a relevant changes in the resources availability it is expected that jackals will be displaced. This is actually considered as one of the main reasons for the species' current status and its difficulties to increase in population numbers.

In Greece the species status in the Red Data Book is defined as "Endangered",andconsidered to be facing a very high risk of extinction in the wild due to the decline of its population and the fragmentation of its habitat.

Based on the field investigations carried out along the proposed pipeline route, the golden jackal occupies regions that are parts of its greater expansion in Evros, Xanthi and SerresRegional Entities.After the specific field investigations five key sections have been identified. These sections are deemed as important for the overall jackal population in the region and therefore shall be considered as areas of special interest in the context of the TAP project. In addition to these sections the presence of vagrant individuals is also expected in wider areas (e.g. outside the 5 key sections).

The 5 key sections along the proposed route, as defined after the field survey are the following (see *Figure 6-64*):

- KP 0 to KP 3. The pipeline passes through jackal territories in the first 3 km of the alignment, close to the Greek/Turkish border and in Nestos area, where also the highest density of jackals is recorded
- KP 34 to KP 35, that is a part of Evros delta, south of Anthia village. In this area, the population is not as susceptible of being affected by the project as in other areas, since jackal territories lie over 4 km southern of the 500m pipeline zone and seem to be connected with the populations of the rest of Evros delta.
- KP 117 to KP 126, that is the northern part of Vistonida lake, between Dialampi and Frourio regions; Jackals groups were detected almost 100m southern of the buffer zone, but vagrant individuals may reach the pipeline corridor
- KP 150 to KP 159, that is a part along Nestos river south of Toxotes town. It is the area with the highest jackal population recorded. The pipeline passes through jackal territories for more than 5 km
- KP 282 to KP 295, that is a part along Strymonas river, SE of Anagenissi village. Jackals seem to follow Strymonas river, moving southwards from Kerkini lake to the river's Delta.

Table 6-63 *Canis aureus* territories reports

Pipeline KP chainage	*Jackal territories within the study area*	*Closest distance to the pipeline*
0 - 3	6	0 m
34 - 35	1	2.12 km
117 - 126	5	100 m
150 - 159	10	0 m
282 - 295	2	0 m

Source: EXERGIA& NCC field survey (October 2012 & April-May 2013)

The number of territories recorded each year in each of these areas does not remain stable but depends strongly on available food sources, habitat suitability and available shelter. All of these areas are considered to be part of greater expansion areas, which allow jackals to have mobility. This is the case in the Evros Regional Entity, where jackals tend to concentrate nearby the Evros River. This river and the surrounding areas are considered as very important for the conservation of this species in the region.

Figure 6-64 Areas of interest along TAP East combined with recorded jackal presence according to literature



Source: WWF Hellas, Giannatos 2004, EXERGIA & NCC field survey (October 2012, April-May 2013)

A thorough analysis of the presence of the jackal along the pipeline route is provided in *Annex 6.5.9.*

6.3.3.2.2 Wolf (*Canis lupus*)

The European Habitats Directive identifies *Canis lupus* as a "*priority species"*; and a *"species of community interest in need of strict protection"* (Annexes II and IV)for the Greek wolf populations only south of the 39th parallel (i.e Central Greece), thus there is no special designation for wolves in Northern Greece. Nevertheless, the wolf (*Canis lupus*) across the country is considered as Vulnerable according to the Red Data Book –Greece.

Within the project area the wolf is likely to inhabit areas of mid and high altitude within the Nestos basin, Pangaio Mountain and the hilly landscape of Evros, Serres and Kilkis sections. The core species' habitat comprises semi-mountainous and mountainous areas below 1200 m.a.s.l where reproduction usually takes place (Iliopoulos, 2010), but the species may be seasonally present in

agricultural areas and the alpine zone. The minimum population size is estimated to about 700 individuals after reproduction period, but local populations are difficult to estimate as wolf packs have large ranges which extend to hundreds of kilometres.

Canis lupus is, also, known to occur throughout western Macedonia in middle and high altitudes wherever there is food availability. The species is less dependent on the habitat type itself and more dependent on the presence of free-ranging herds. The total Greek population is estimated at 600 individuals but it could be higher. Local populations are difficult to estimate as the wolf packs have large ranges which extend to hundreds of kilometres and they may cross the borders of Greece in several cases.

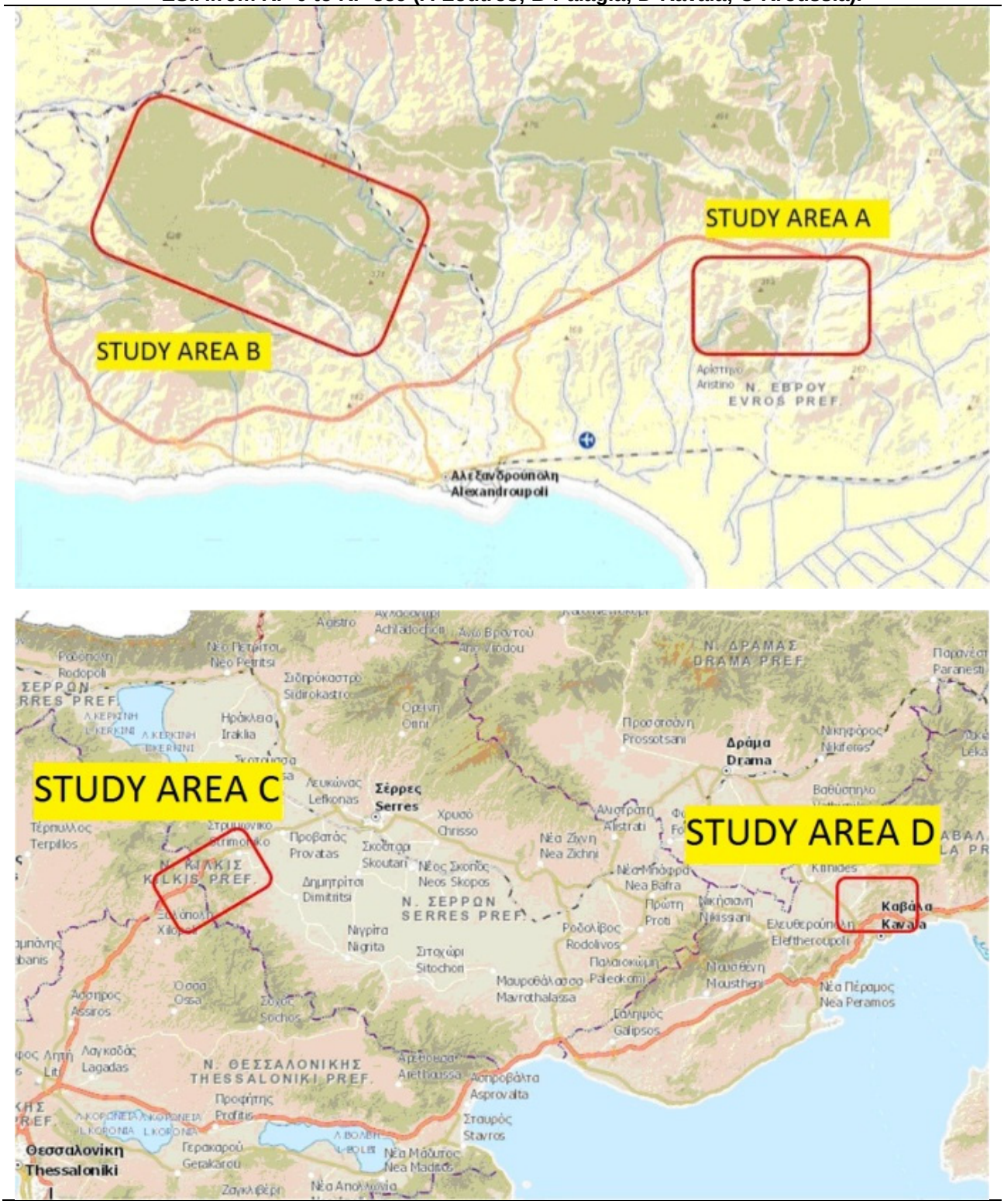
In order to investigate the potential presence of the wolf along the pipeline route a number of areas of interest were selected. The selection was based on bibliography and expert judgment,and aimed in identifying those areas where the species was expected to be potentially present. The remaining areas of the pipeline route were assumed to be marginal for the wolf populations, although the presence of vagrant individuals may be possible (especially on the outskirts of the mentioned areas of interest).

The location of the mentioned areas of interest as well as the findings after the field surveys are presented below.

East Section (from KP 0 – 359)

In the East section, the wolf homesite suitability was explored in 4 areas, namely Loutros area (Study Area A), Palagia– Kirki (Study Area B), Kavala Mountains (Study Area C) and Krousia Mountains (Study Area D) (see Figure 6-65). It is expected that in the East section, TAP alignment will affect a minimum of 6 wolf packs as estimated from the number of home sites detected, their spread and observations during the field trip.

Figure 6-65 Selected priority study areas for field investigation and analysis during the TAP ESIAfrom KP 0 to KP 359 (A-Loutros; B-Palagia; D-Kavala; C-Kroussia).



Source: ASPROFOS (2013)

Main findings for each for each of the 4 areas are:

a) Loutros area (KP 24 – 33)

At Loutros, the TAP corridor partially bisects the most suitable homesite area from approximately KP 26 to 31.As per the conclusions in this area,TAP alignment would affect at a minimum two (2) wolf packs at Loutros area.

b) Palagia– Kirki (KP 43 – 62)

At Palagia – Kirki region, the route goes through habitat of high suitability but because the corridor crosses low-slope ridges, critical sites for the species are unlikely to be affected. As per the conclusions in this area, TAP alignment would affect at a minimum two (2) wolf packs.

c) Kavala Mountains (KP 183 - 193)

At Kavala mountains, TAP alignment will likely affect two (2) packs of wolves with the most suitable homesite domain and closest to the TAP alignment being located from KP 189 to 191 at a distance of 0-1,200m.

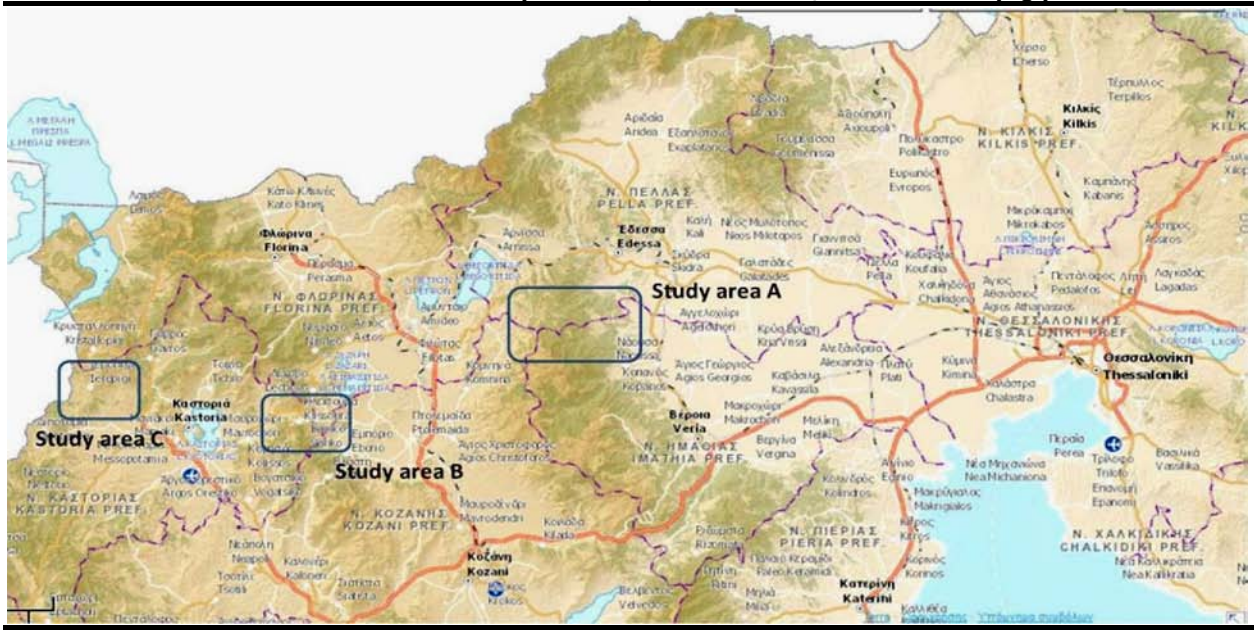
d) Krousia Mountains (KP 295 - 325)

The segment stretching from KP 296 to 310 crosses highly suitable wolf habitat and also very highly suitable large ungulate habitat.

West Sections (from KP 359 to KP 543)

In the West section, the wolf homesite suitability was explored in 3 areas, namely (1) Vermio Pass - Study Area A (KP 431-452), (2) Kleisoura Pass - Study Area B (KP 491-501), (3) Oinoi - Ieropigi pass - Study Area C (KP 538-564) (see *Figure 6-66*). It is expected that the West section route alignment will affect a minimum of 4 wolf packs as estimated from the number of home sites detected, their spread and observations during the field trip.

Figure 6-66 Selected priority study areas for field investigation and analysis during the TAP ESIA from KP 359 KP 543(A-Vermio; B-Kleisoura, C-Oinoi - Ieropigi)



Exergia (2012)

In total, it is expected that a minimum of 10 packs (i.e. 10 different wolf territories) would be affected along the entire proposed pipeline route.

A thorough analysis of the presence of the wolf along the pipeline route is provided in *Annex 6.5.3*.

6.3.3.2.3 European ground squirrel (*Spermophilus citellus*)

The species is listed in Appendix II of the Bern Convention, which includes strictly protected fauna species and Annexes II and IV of the EU Habitats and Species Directive, which include species requiring designation of Special Areas of Conservation, and species in need of strict protection, respectively. In accordance with the European legislation, the species is protected in Greece by the Presidential Decree of 1981 (67/81).The species is assessed as Vulnerable by the IUCN and the Greek Red data Book as well (Youlatos, 2008).

From a conservation point of view, *Spermophilus citellus* is one of the most important species within the Study Area. The species is endemic to central and south-eastern Europe and is

considered to be dependent on short-grass open vegetation (Coroiu et al., 2008), where it follows an omnivorous diet including seeds, green plant parts, flowers, insects and roots (Mc Donnald and Barrett, 1993). The Greek populations of the European ground squirrel are considered to be in decline and severely fragmented (Youlatos, 2008), however systematic surveys concerning the occurrence and the ecology of the species are lacking. Data about the present and historical occurrence of the species are scarce, while data related to the biology and ecology of the species are available only from two populations in Thermi region, part of Thessaloniki Regional Entity. According to Youlatos (2008), European ground squirrel occurs only in the northern part of Greece and includes 3 clearly defined and probably isolated sub-populations, located in western Macedonia, in central Macedonia and in Thrace. In western Macedonia, the species inhabits regions of Kozani and Giannitsa, and also in central Macedonia in the regions of the Axios valley, Gallikos, Hortiatis, Thermi, Pilaia and regions of Serres. In western and central Macedonia the subspecies Spermophilus citellus gradojevici is mainly occurs (Youlatos, 2008; Helgen et al., 2009).

For a complete list of sites of colonies according to the literature see *Annex 6.5.4*.

Along the West Section, European ground squirrel is distributed in two distinct areas along the 500 m study area.

The key findings from the assessment of the species are presented in *Table 6-64 a*nd *in*

Figure **6-67** that follows below

Table 6-64 Potential and confirmed*Spermophilus citellus* presence along the TAP route

No.	*Geographical area*	*Approx. KP chainage*	*Habitat*	*General comments*
1	Near Kipoi	0 - 4	Clover field	A colony detected at KP 3.4 that according to local people may extend between KP 0 and 4
2	Near Kavisos	17.3	Fallow field	One potential colony observed
3	Between Lofario and Aetolofos	73 - 76	Meadows with *Paliurus* spp	Holes detected at KP 73.8 and considered to be part of one colony, extending between KP 73 to KP 76.
4	Drymos Village	341 - 343	Fallow field, Meadow field, Cultivated field	Two systems of burrows both within the 500 m corridor. However only two of the burrows seemed active. Potential remnants of a larger colony.

No.	*Geographical area*	*Approx. KP chainage*	*Habitat*	*General comments*
5	Nea Messimvria to Gefyra villages	361 - 369	Agricultural land	A minimum of five (5) colony reports[30] were detected within this area
6	Maniakio to Galateia villages	454 - 472	Agricultural land	This area hosts up to 13 colonies

Source: EXERGIA field survey (June 2011, October 2012), NCC field survey (May 2013)

Figure 6-67 Potential and confirmed *Spermophilus citellus* presence along TAP route



Source: ASPROFOS (2013), ERM (2012)

[30] colony reports: species homesite detection which may refer to the same or different colonies

6.3.3.2.4 Bear (*Ursus arctos*)

Bears (*Ursus arctos*) are protected under Greek legislation and are an “endangered” species according to the Red Data Book - Greece. At the EU level, *Ursus arctos*, is identified as a “priority species” and a “species of community interest in need of strict protection“ by the Habitats Directive (Annexes II and IV).

Ursus arctos has a well-established population on Mount Grammos with a maximum of 41 individuals (South-west part of the Study Area) and has expanded towards other mountains of western Macedonia since the end of the 1980s. The Mount Vermion and Mount Askion are parts of the mountainous range where the bear is constantly present. Recordings in Mount Vermio are thought to belong to vagrant animals and there is no evidence of a permanent population there.

Analysis of habitat use for the Mount Grammos bear population has shown that mixed agroforestry habitats are a habitat type commonly used. Mixed broadleaved forests with*Castanea sativa* and *Coryllus avellana*are also extensively used; home range sizes vary extensively between male and female animals and between different seasons rising up to hundreds of square kilometres. As a result, it seems that the species is well dispersed within the whole mountainous part of the Study Area, although the status of the population in certain regions (constant, vagrant) may differ or may vary from year to year, often as a result of transboundary movement.

Overall, suitable brown bear habitats can be found on both sides of the TAP route and over a relatively large area. Nevertheless there are 3 main highly suitable areas respectively as follows:

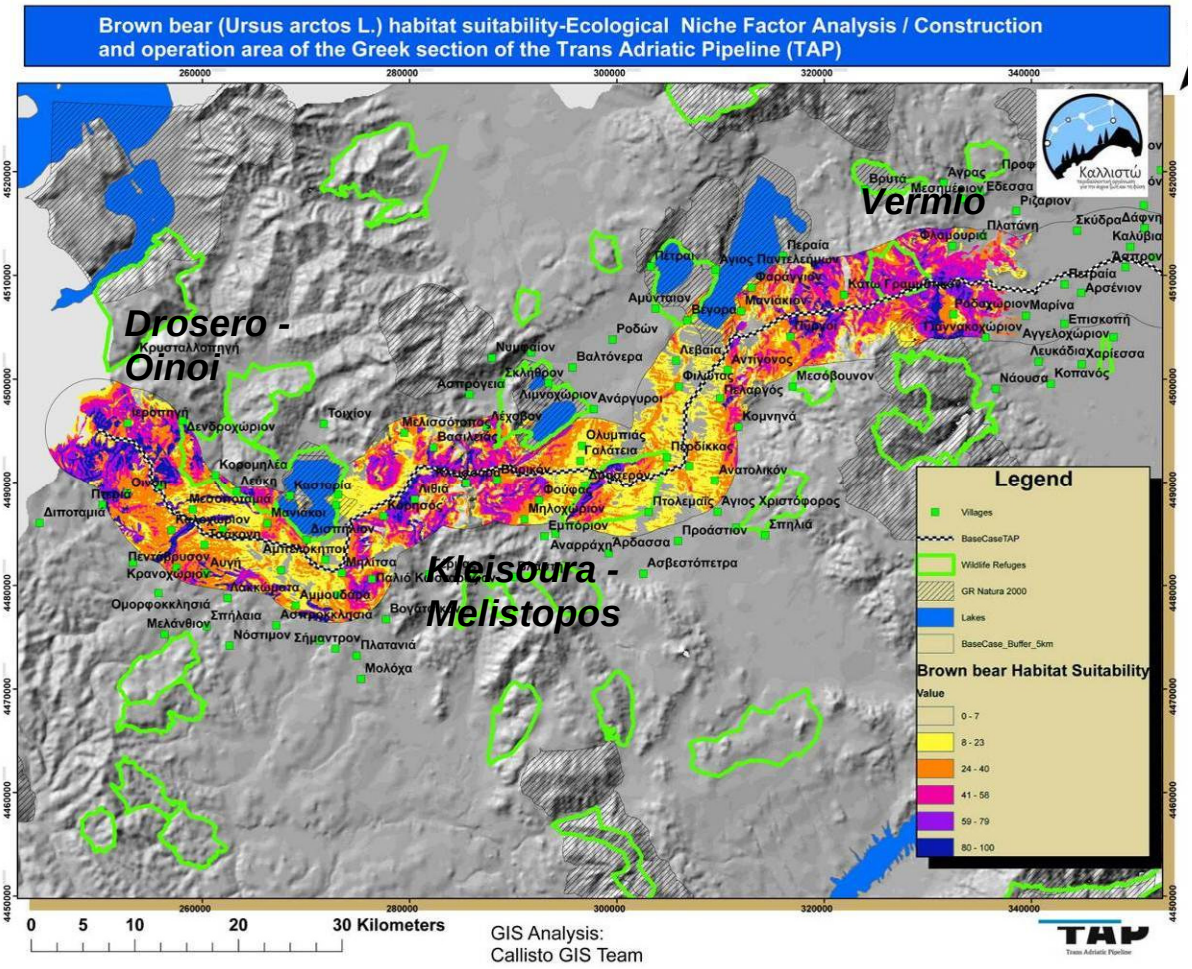
a) Vermio Mountain at the areas of Giannakoxori-Rodoxori villages

b) Kleisoura-Lehovo area, including the villages of Variko,Kleisoura, Korrissos, Vasiliada, Melisotopos and

c) Greek – Albanian border, at the area of Drosero and Aliakmonas River villages of Ampelokipoi, Mesopotamia, Oinoi

The following figures show the habitat suitability for *Ursus arctos*and potential denning sites.

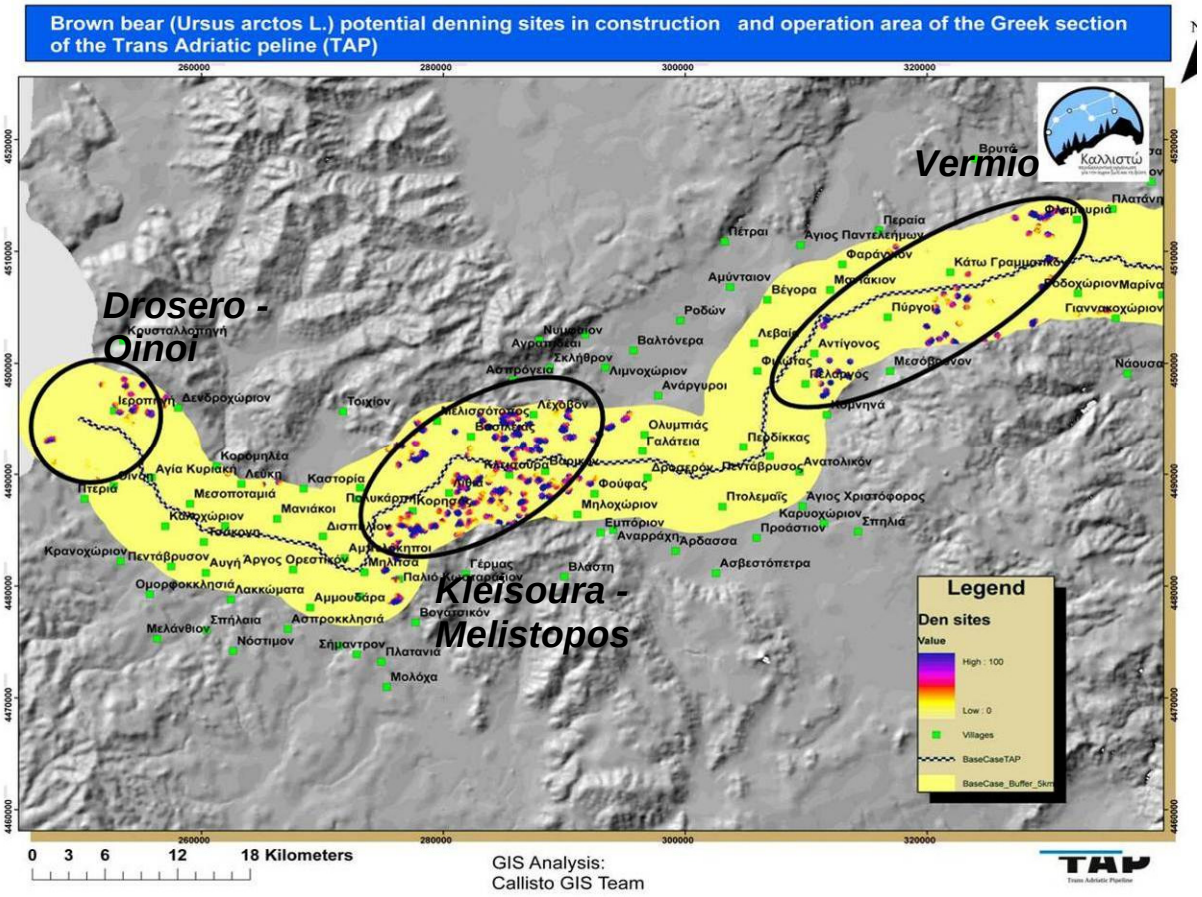
Figure 6-68 Bear Habitat Suitability



Source: NGO "Callisto" [31] *(Environmental Organisation for Wildlife and Nature) GIS Team (October 2011)*

[31] http://www.callisto.gr/en/callisto.php

Figure 6-69 Potential Bear Denning Sites



Source: NGO "Callisto" (Environmental Organisation for wildlife and nature) GIS Team (October 2011)

Some key findings on the abovementioned sections are as follows:

- Kleisoura (KP segment 490.2-496.2)

Strong evidence of bear presence was found in this area during the field survey. Feeding signs, territorial and reproductive marking (marks on telegraph poles) and daybeds where located within the 500 m buffer zone indicating permanent use of the area by bears. Additionally, the habitat is of high suitability for bear (especially at KP 493.8-496.2) and the possibility of den sites is among the highest.

- Aliakmonas River area (KP segment 526.7-528.7)

There was strong evidence (footprints) of frequent use of the riparian forest as a functional corridor between larger parts of habitat in adjacent regions but also as a functional habitat itself. The latter was strongly evidenced by telemetry locations. Although there is no possibility of winter dens in this area the bears may use dense parts of the riparian forest vegetation as daybeds.

- Borders region (KP segment 538.9-543.2)

Bears are present in this area as clearly indicated by the frequent bear marking on telegraph poles (a sign of reproductive and territorial behaviour), the regular use by two radio-collared bears and the high possibility of den sites on either side of the pipeline route. The habitat is of high suitability for bears.

A thorough analysis of the presence of bear along the pipeline route is provided in *Annex 6.5.2.*

6.3.3.2.5 River Evros

Jackal

One territory of jackals crossed by the pipeline has been confirmed at the immediate vicinity of the river Evros (KP 0– 3).

Wolf

This area is not considered a suitable habitat for wolves, therefore they have never been observed and are not expected to be found in this section.

European Ground Squirrel

One sampling site where a colony might possibly survive has been recorded within a clover field at KP 3.4 (*Table 6-64*). According to local people, the species may be located on a broader area which would include from KP 0 to KP 4 of the pipeline route.

6.3.3.2.6 Southern Evros

Jackal

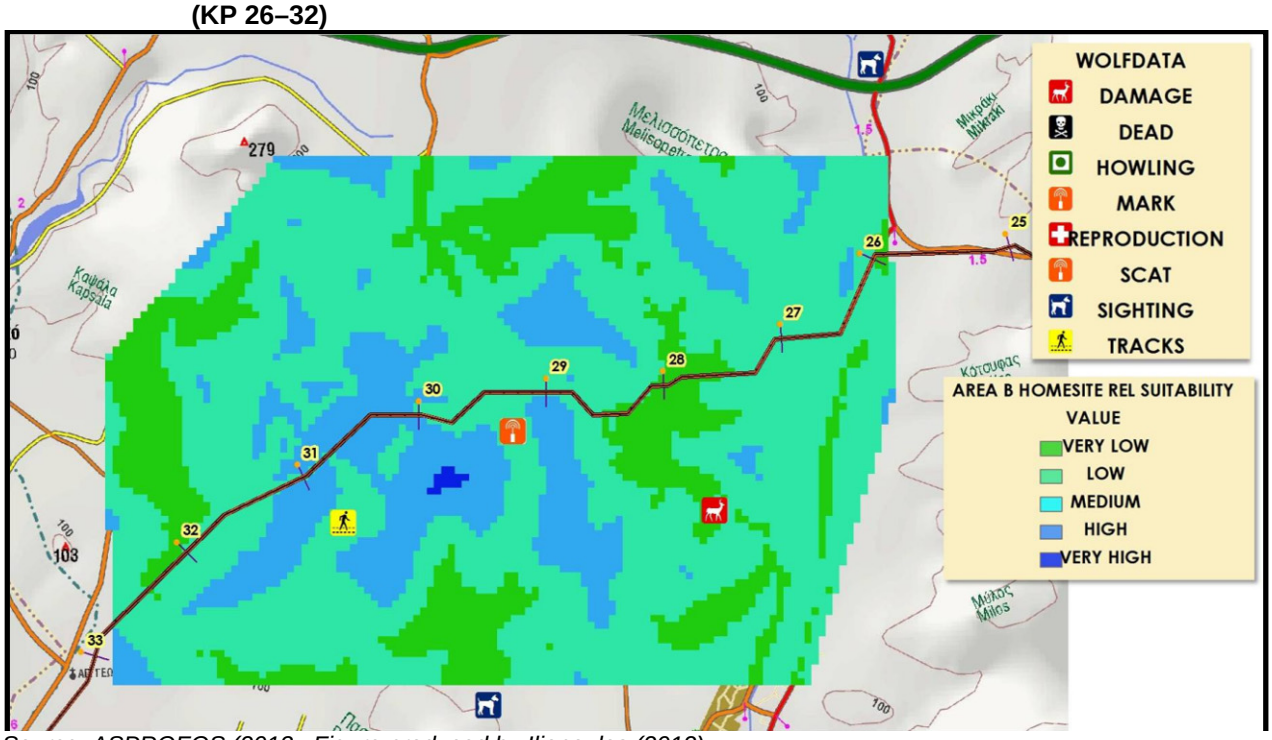
One territory outside the project area but in the vicinity of the pipeline has been recorded south of KP 34– 35.

Wolf

On the Southern Evros Section two areas are known to host wolves.

The Loutros area (KP 24 – 33) is part of a large wolf pack home range (territory) that encompasses a much larger region. Field data and reported information indicate permanent presence of wolves in the area with frequent observation of more than four (4) wolves and up to eight (8) individuals. Sites with medium to high suitability for denning and rendezvous site were identified during field visits and modelled at desktop work (*Figure 6-70*), with the most probable being located approximately northwest of the Loutros village at both sides of the route along the KP 29 - 32 segment. This area was inspected during field visits and model predictions seem to partially correspond to field data, although the low number of interviews with local people did not permit a thorough validation of the area as a reproduction one. This segment includes a high suitable homesite habitat crossed by the proposed pipeline route between KP 30 and 31, despite being aligned with the already existing DESFA pipeline on the ridges in the area. Wolf presence is considered as permanent.

Figure 6-70 WolfHomesite Relative Suitability and Wolf Presence in study area A (Loutros-Pefka) (KP 26–32)



Source: ASPROFOS (2013. Figure produced by Iliopoulos (2012).

The Palagia– Kirki area (KP 43–62) was considered as more “suitable” for wolf with regards to the habitat types and condition. Wolf presence in general is permanent all year round. Livestock, which is the main food resource for wolves, is abundant and there is very good quality denning habitat. However, the high density of forest roads and anti-fire zones fragmenting the habitat

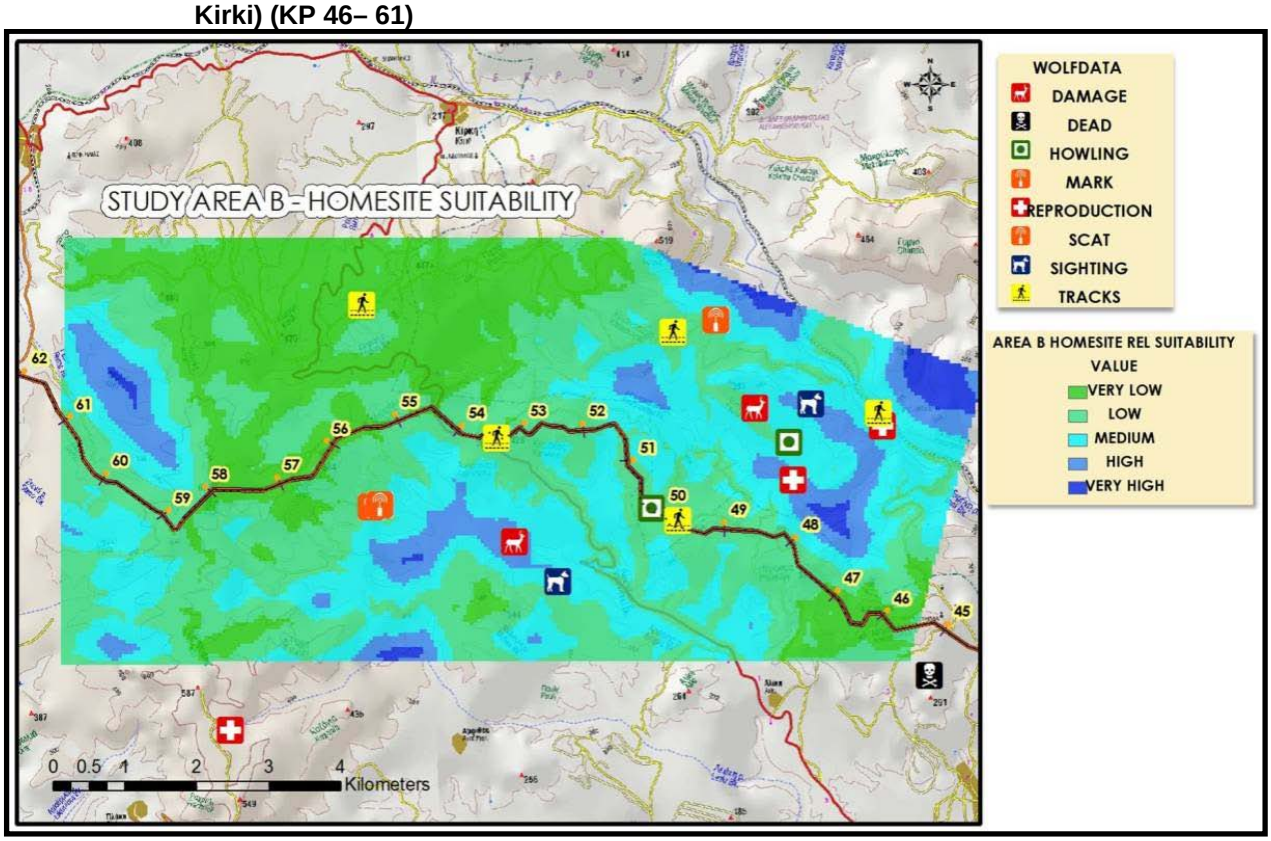
patches (including the DESFA pipeline PPS zone) act as an important drawback against the establishment of denning sites despite the presence of good quality vegetation. Thus suitable homesites appear to be a limited resource within the Palagia– Kirki area at least in the vicinity of the TAP pipeline alignment but none of the three high suitable sites identified is directly crossed by the pipeline route (*Figure 6-71*).

Three main homesite regions were identified within the Palagia-Kirki area. The one considered as the most suitable, and close to TAP route, is located northeast of KPs 47 to 50 close to the village of Palagia. This area was reported as a frequent wolf reproduction site while wolf signs (tracks and scat/marks) were found during field trip in the surrounding areas.

The second wolf homesite area predicted by the suitability model is located south of the KP 52-57 segment and its use as a wolf core site has been confirmed by local shepherds and by signs of recent activity of a territorial wolf pack found during field visits.

The third potential wolf pack homesite is located northeast of the KP 59- 61 segment close to the village of Sykorachi. The existence of several sheep and goat farms may reduce its potential as denning area due to increased disturbance by livestock flocks and shepherds dogs roaming the area. Presence of a wolf pack of 4 individuals was confirmed in the adjacent areas (tracks in dust), but it was not directly associated with that particular homesite.

Figure 6-71 Wolf homesite relative suitability and wolf presence data in study area B (Palagia–Kirki) (KP 46– 61)



Source: ASPROFOS (2013). Figure produced by Iliopoulos (2012).

<u>European Ground Squirrel</u>

One potential colony was recorded near Kavisos at a fallow field at KP 17.3, although whether it is an active or a former colony has not been confirmed as it was observed during the hibernation period when burrows seem to be closed, and no other indication of *Spermophilus* presence was detected in the surrounding areas.

6.3.3.2.7 Lowlands of Evros

<u>Jackal</u>

According to the literature and the field survey there is no evidence of jackal territories in the area.

Wolf

This area is not considered a suitable habitat for wolves; thereforethey have notbeen observed and are not expected to be found in this section

European Ground Squirrel

The potential presence of *Spermophilus citellus* was recorded at two sites within this section within meadows of *Paliurus* spp at KP 73.8 and KP 75. They are considered to be part of the same colony, which, according to the information provided by local people, could be expanded between KP 73 and KP 76.

6.3.3.2.8 Komotini – Xanthi Plain

Jackal

Two main areas were recorded to host Canis aureus populations within this section. The first one, located north and north-east of Vistonida lake, between KP 115 and 126 hosts at least 6different jackal groups while the second one, located around Nestos river (KP 149 to 164) includes the presence of 8 jackal groups. This section hosts, according to literature, the largest Jackal population in Greece.

Wolf

According to the literature the species is known to be present on the mountainous parts of the Nestos basin but its status in the lowlands crossed by the pipeline route is poorly known. In any case no suitable denning sites are expected, and only vagrant individuals are considered to be potentially and temporarily present within the area of influence of the pipeline in this section.

European Ground Squirrel

According to Vohralik & Sofianidou (1992) the species is reported to be present at Kirnos and Olvio east of river Nestos, more than 3 km away from the pipeline route. However, no colonies have been observed on the 500 m corridor during the field survey.

6.3.3.2.9 Kavala Mountains

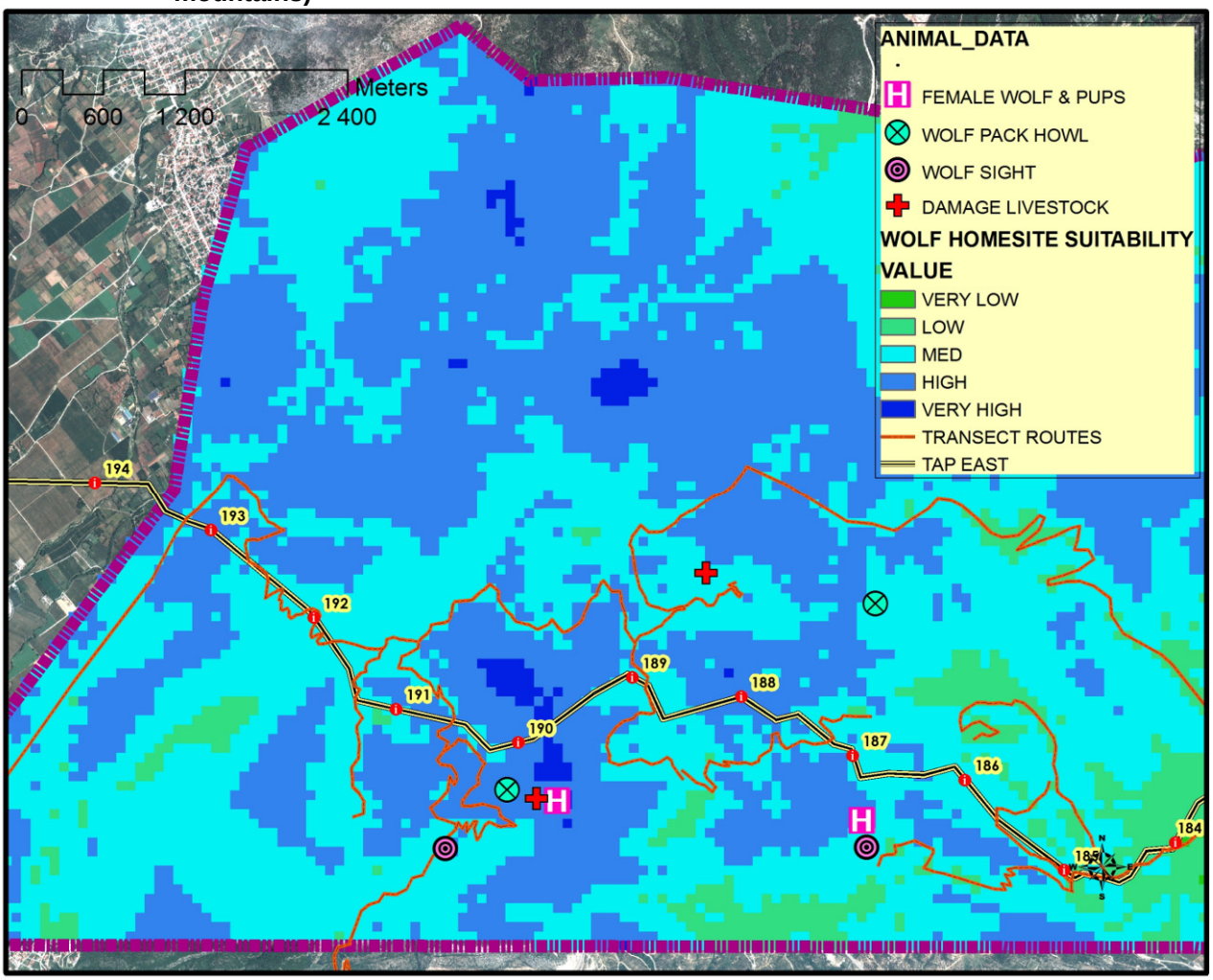
Jackal

According to literature data, the species does not hold territories in this section.

Wolf

In Kavala Mountains section two homesite domains were predicted by the model (*Figure 6-72*) andverified in the field. The most suitable one is located at the 189-191KP segmentand is crossed by the pipeline. Frequent wolf reproduction has been reported in the area by local farmers and by observations of female wolves with pups and frequent sounds of wolf group howling, while habitat evaluation confirmed suitability both for foraging and reproduction of wolves. Wolf presence is considered as permanent and present all year round in the area, despite the high human presence. This is due to the existence of deep ravines where the presence of livestock and dogs is limited. Suitable homesite habitat appears to be a limited resource in this area due to the highly humanised environment.

Figure 6-72 Wolf homesite relative suitability and wolf presence data in study area B (Kavala mountains)



Source: ASPROFOS (2013). Figure produced by Iliopoulos (2013).

European Ground Squirrel

According to literature data, the species is not present in this section.

6.3.3.2.10 Filippoi Plain

Jackal

According to literature data, the species does not hold territories in this section.

Wolf

According to literature data, the species is not present in this section.

European Ground Squirrel

According to literature data, the species is not present in this section.

6.3.3.2.11 Serres plain

Jackal

The whole area around Strymonas river is a mosaic of cultivated fields, reeds, remnants of wetland vegetation with stands of *Populus* sp., which in combination with permanent water presence and low use of forest roads, form a very suitable habitat for jackal groups. Shepherds in Strymoniko and Provatas point out that the jackal's population shows an increasing trend in the area over the last three years and the area can possibly be also a corridor between the populations of Kerkini lake in the north and those in Strymonas Delta in the south (Amphipoli village).

During the field survey two jackal groups with young were detected around the area of Provatas village (KP 281 to 296), where also recently an individual jackal was found dead on Egnatia highway.

Wolf

The species is known to inhabit hilly and mountainous sections of the area but detailed spatial data are not known. Its presence along the pipeline route is only expected as a consequence of vagrant individuals as no suitable homesite habitats are crossed by the proposed route.

European Ground Squirrel

According to literature data, the species is not present in this section.

6.3.3.2.12 Kroussia Mountains

Jackal

According to literature data, the species does not hold territories in the vicinity of the pipeline area and thus its presence is not expected.

Wolf

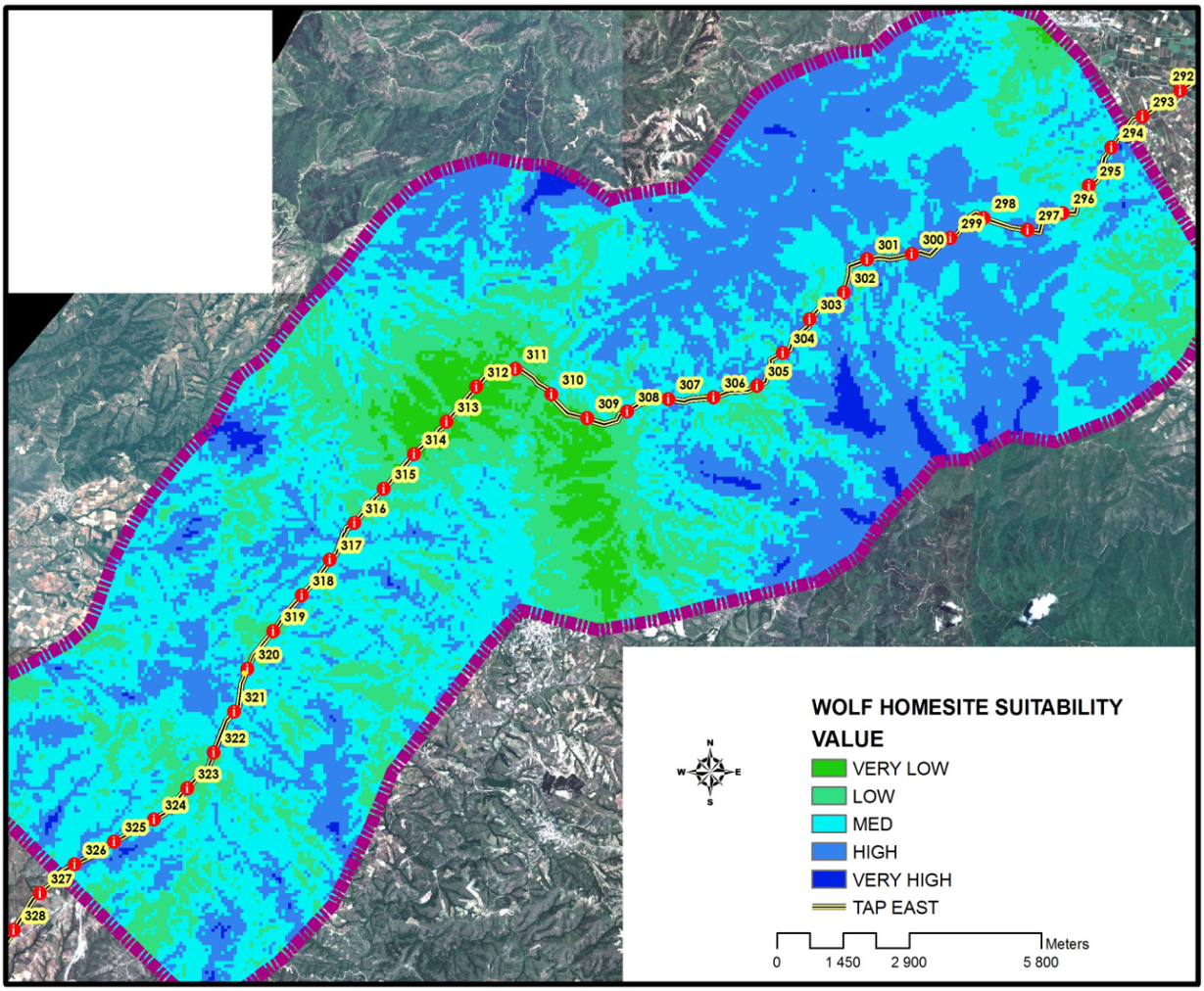
In Krousia Mountains (KP 295 - 325) field data and reported information indicate permanent presence of wolves in the whole study area with at least five (5) wolves per pack according to track counts.

However, the area crossed by the pipeline between KP 311 and 326 appears to have low to medium homesite suitability, and wolf reproduction is not expected there. This is because the suitable areas for wolf resting or rendezvous sites that exist in the specific area do not form large blocks of unfragmented habitat suitable for denning and reproduction.

On the contrary, the pipeline route between KP 296 and 310 crosses highly suitable wolf habitat and also very highly suitable large ungulate habitat (roe deer and wild boar). High densities of wild ungulates were recorded in the area together with evidences of wolf predation on these species. Two main homesite domains were predicted from habitat modelling and confirmed through direct field evaluation(Figure 6-73and Figure 6-74) and are located north and south of the pipeline betweenKP 297 and 308.

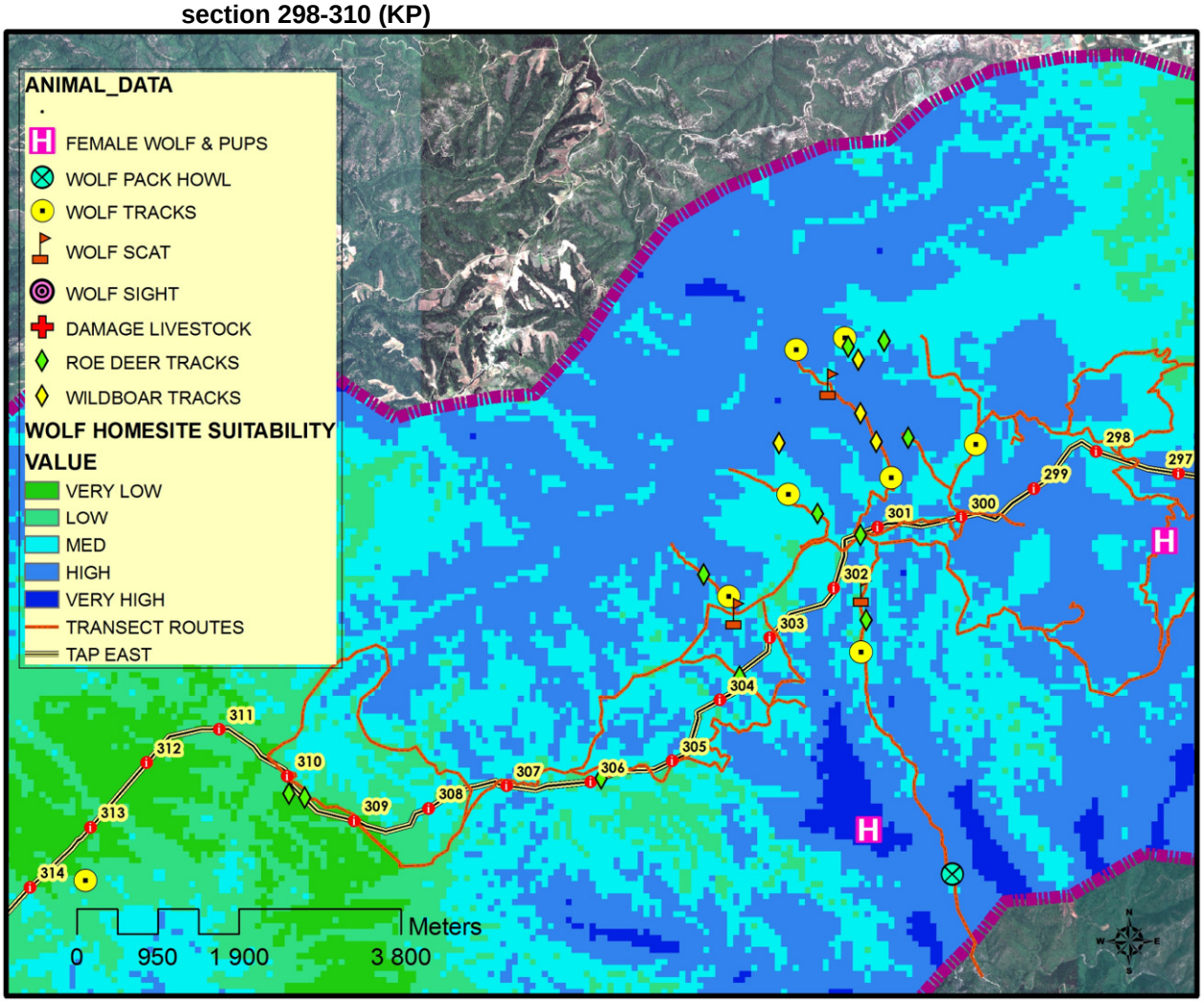
The most suitable homesite region (den sites, rendezvous sites) is located approximately southeast of Kefalohori village at distances from 1500 to 4500 m to the pipeline centreline (approximately between KP 303 and 305).Wolf reproduction at this area was reported from local residents while tracks of five (5) wolves were observed. Additionally the pipeline route crosses highly suitable wolf homesite habitat northeast of the village Kefalohori from KP298.6 to 300.

Figure 6-73 Wolf homesite relative suitability in the Krousia mountains



Source: ASPROFOS (2013). Figure produced by Iliopoulos (2013).

Figure 6-74 Wolf homesite relative suitability and wolf presence data in the Krousia mountains-section 298-310 (KP)



Source: ASPROFOS (2013). Figure produced by Iliopoulos (2013).

<u>European Ground Squirrel</u>

According to literature data, the species is present at Kroussia Mountains but detailed spatial data are unknown.

6.3.3.2.13 Gallikos Plain

<u>Jackal</u>

According to literature data, the species does not hold territories in the vicinity of the pipeline area.

Wolf

The species is not known to inhabit areas adjacent to the pipeline and the habitat within this section is not suitable for wolf reproduction or permanent living.

European Ground Squirrel

Two systems of burrows have been detected north-west of Drymos Village (KP 341 to 343) within the 500m corridor, in a fallow field and a meadow respectively, including some holes in large cereal fields. One of them (KP 342.3) presented clear evidence of recent activity confirming the presence of the species, altough the other one seemed abandoned. Both systems seem to be the remnants of a larger colony.

6.3.3.2.14 Axios Plain

Bear

This area is not a suitable habitat for bears, therefore they have never been observed and they are not expected to be found there.

Wolf

This area is not a suitable habitat for wolves, therefore they have never been observed and they are not expected to be found there.

European Ground Squirrel

A population of European ground squirrel was found along the Axios Plain section ranging from Nea Mesimvria to the valley of the Axios River, north of Gefyra village. Nine (9) sampling locations were found to host at least 7 Spermophilus colonies, with 4 of them in cereal fields, one in a meadow and two along a dirt road which was close to Axios River.

The eastern colony, found around KP 361 appears to cover a quite large area, extending from the southern limit of the 500 m zone, further west and possibly further north outside the 500 m zone. The remaining colonies of the group are located closer to Axios River, from KP 367 to KP 369 and seem to be loosely structured. Communication among the colonies within this group seems possible, as there is no clear separating factor and the distance among them is rather short.

6.3.3.2.15 Vermio Mountain Slopes

Bear

Two specific sections on the Vermio mountain slopes have been identified as most relevant and considered to host habitats where bears could be present:

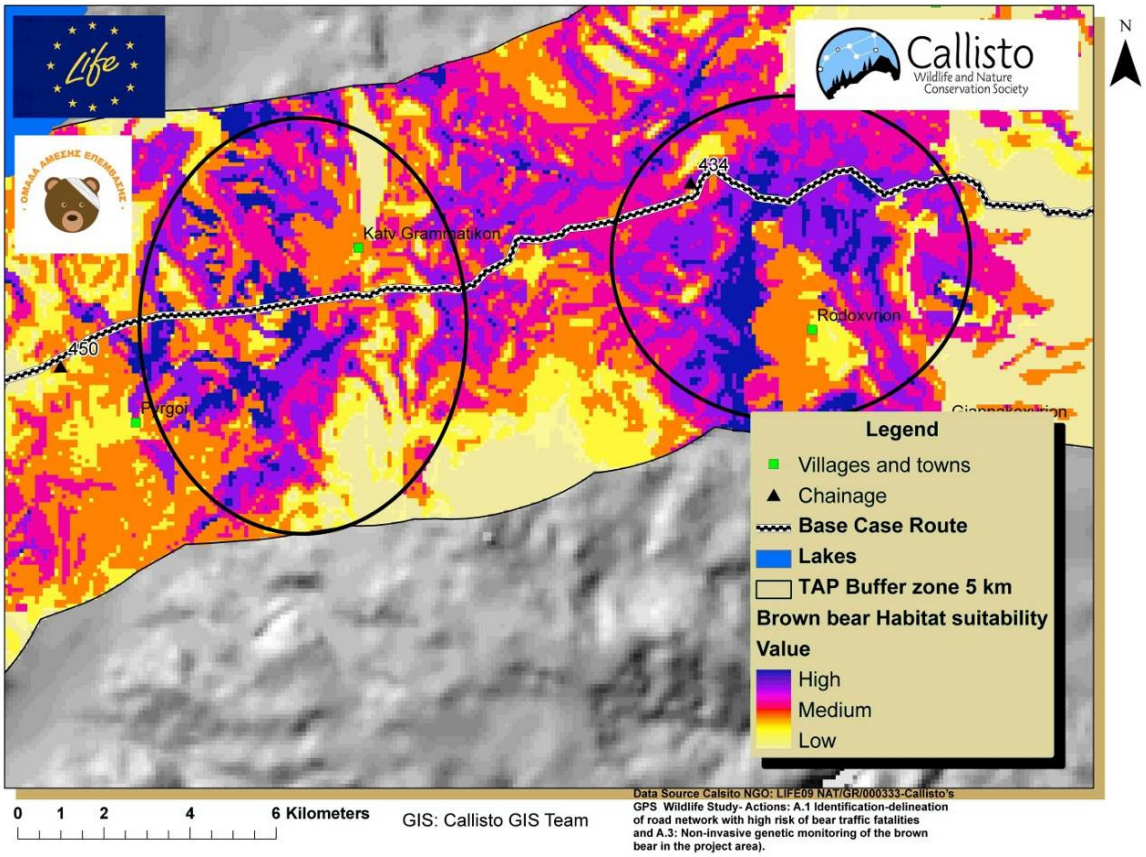
- Vermio 1 (KP 429.4-436.6))

  No signs were found during the field survey session. However, records from previous years indicate sporadic but regular presence of individuals in the area as a result of a dynamic recolonization process of former bear range. Furthermore, information from interviews with local people as well as the high habitat suitability clearly indicates the permanent use of this area by bears given the former range recolonization process which is underway.

- Vermio 2 (KP439-444.5)

  It is also recognised as a bear habitat of high suitability. Although no signs of presence were found, a high probability of den sites occurrence is present.

Figure 6-75 Bear Habitat Suitability on Vermio Mountain Slopes

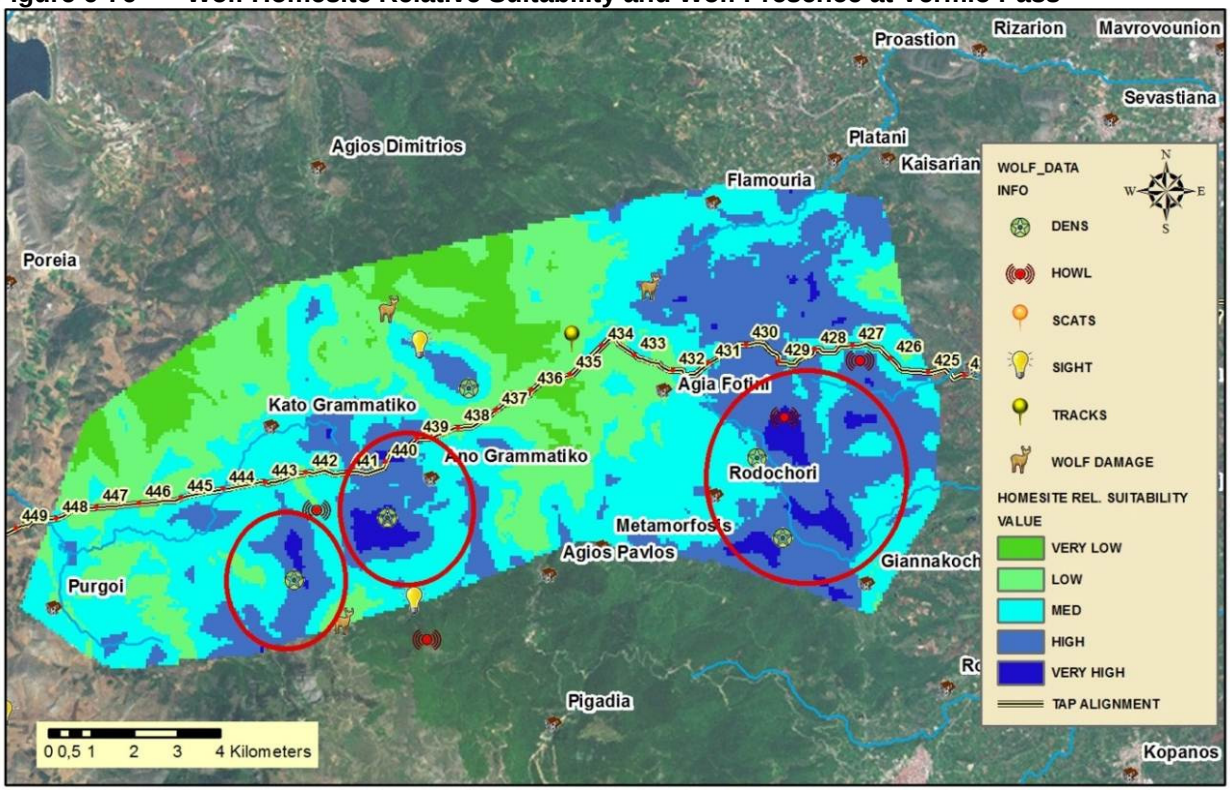


Source:NGO "Callisto" (Environmental Organisation for wildlife and nature) GIS Team (October 2011)

Wolf

The first homesite region that was predicted is located south of KP 442.5 near to Kato Grammatiko, while a smaller in size reproduction area was predicted north of the KP 437.5 in a dense beech forest. The second homesite region was predicted in the northeast of the first one and fully encompasses the KP 438 to KP 442 segment and the third and larger mainly in the south of the area between KP 429 and KP 431, where there are reports on recent wolf pack presence and also sightings of wolf pups in 2010.

Figure 6-76 Wolf Homesite Relative Suitability and Wolf Presence at Vermio Pass



Source: ERM (2012). Figure produced by Iliopoulos (2011).

European Ground Squirrel

The species has been historically reported on the Mount Vermio slopes. Based on the findings from the field surveys a small section of the section hosts *Spermophilus* colonies within the working strip (see Ptolemaida Basin for details).

6.3.3.2.16 Ptolemaida Basin

Bear

This area is not a suitable habitat for bears. The species has never been observed along this section and are not expected to be found here.

Wolf

This area is not a suitable habitat for wolves, therefore they have never been observed and they are not expected to be found there.

European Ground Squirrel

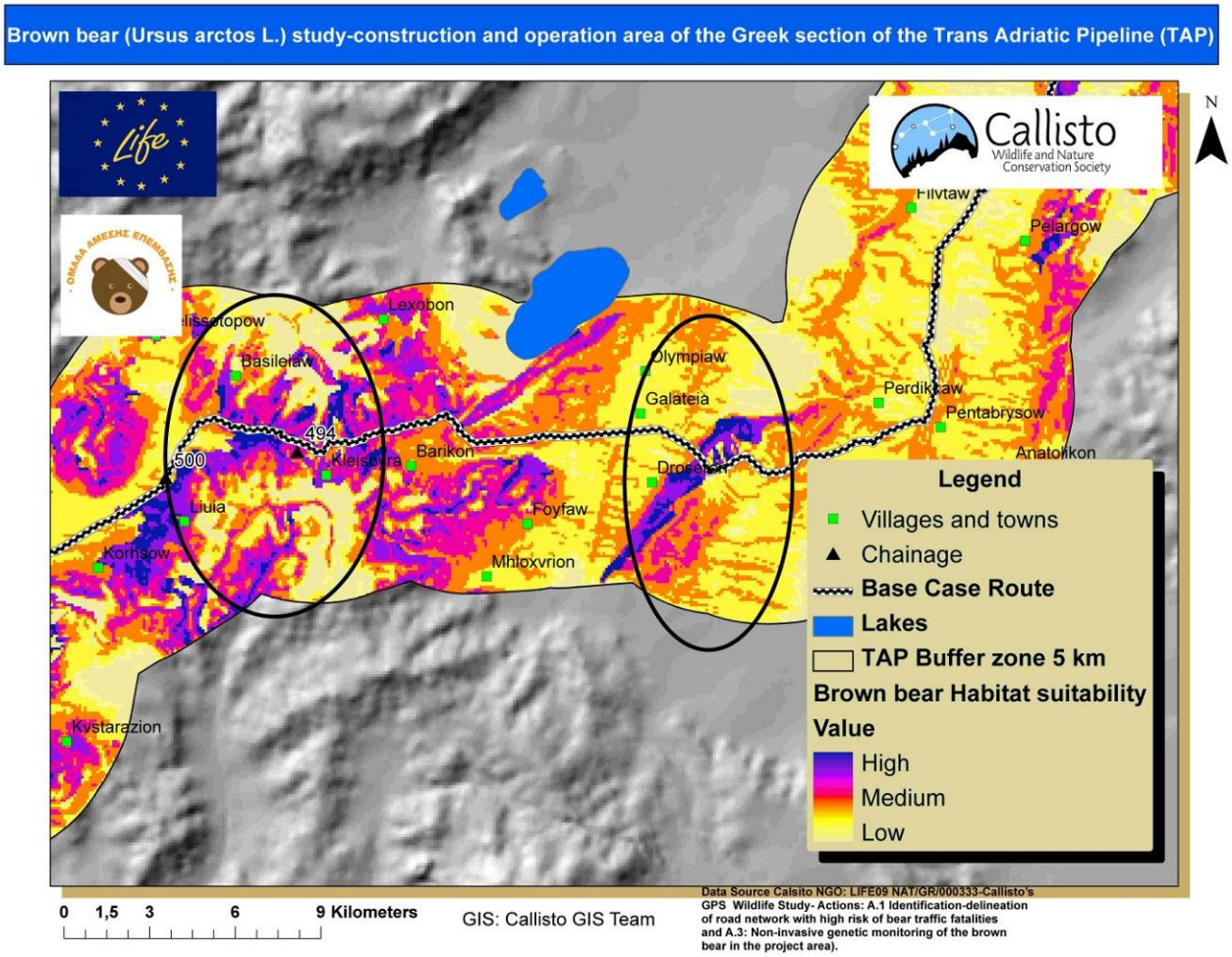
The species has been recorded several times within the Eordea Plain, between the lakes of Vegoritida and Chimaditis, corresponding to the area from KP 453.8 to KP 481.5. Seventeen (17) sampling sites were recorded to host European ground squirrel (*Spermophilus*) colonies at this part of the route, with the majority of them (44.4%) lying in meadows, followed by alfalfa fields (33.3%), fallow fields (11.1%) and cereals fields (5.5%).

6.3.3.2.17 Askion Mountain Slopes Section

Bear

Strong evidence of bear presence in the Askion Mountain slopes section between KP 490 and KP 496 was found during the field survey. Feeding signs, territorial and reproductive marking (marks on telegraph poles) and daybeds where located within the 500 m buffer zone indicating permanent use of the area by bears. Additionally, the habitat is of high suitability for bear (especially between KP 493.7 to 496) and the possibility of den sites is among the highest.

Figure 6-77 Bear Habitat Suitability on Askion Slopes



Source: NGO "Callisto" (Environmental Organisation for wildlife and nature) GIS Team (October 2011)

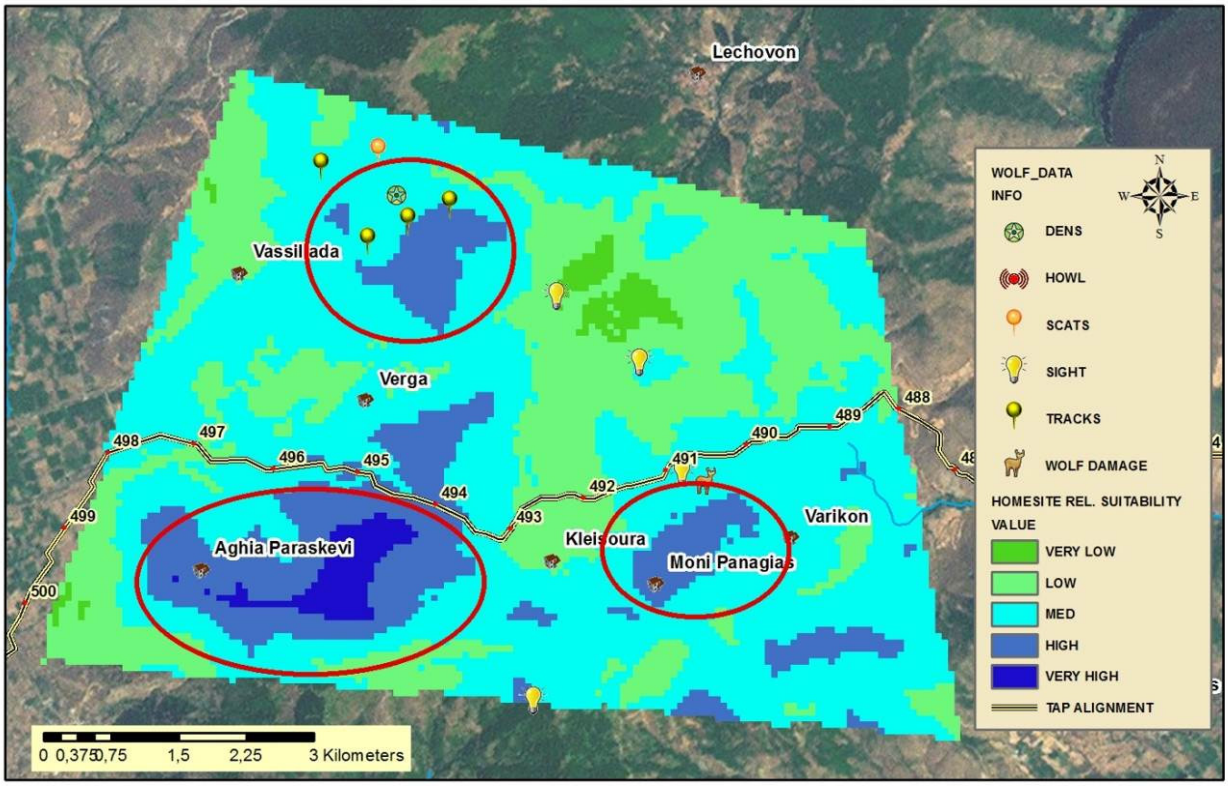
Wolf

On the Askion Mountain slopes section three homesite areas were predicted by the model used. The most suitable area is located south of the KP 494 to 497 and westwards of Kleisoura village, although this area was not reported as a wolf reproduction site but probably this was the result of a low sampling effort considering interviews with local inhabitants at this area. The pipeline alignment is close to the core of this area.

The second potential wolf homesite area predicted by the suitability model was located in the north of the KP 495 to 491 segment close to Verga village. Actual use of this area as a wolf reproduction site was confirmed and referred to by local hunters as a traditional reproduction site. Moreover many signs of recent activity of a territorial wolf pack were found during field visits, while field observations confirmed high suitability of the area.

The third potential site is located in the south of KP 495 to 496 segment westwards of the Variko village, although it was not evaluated in the field due to limited availability of time.

Figure 6-78 Wolf Homesite Relative Suitability and Wolf Presence at Kleisoura Pass



Source: ERM (2012). Figure produced by Iliopoulos (2011).

European Ground Squirrel

No published reports were identified or observations during the field trip were made.

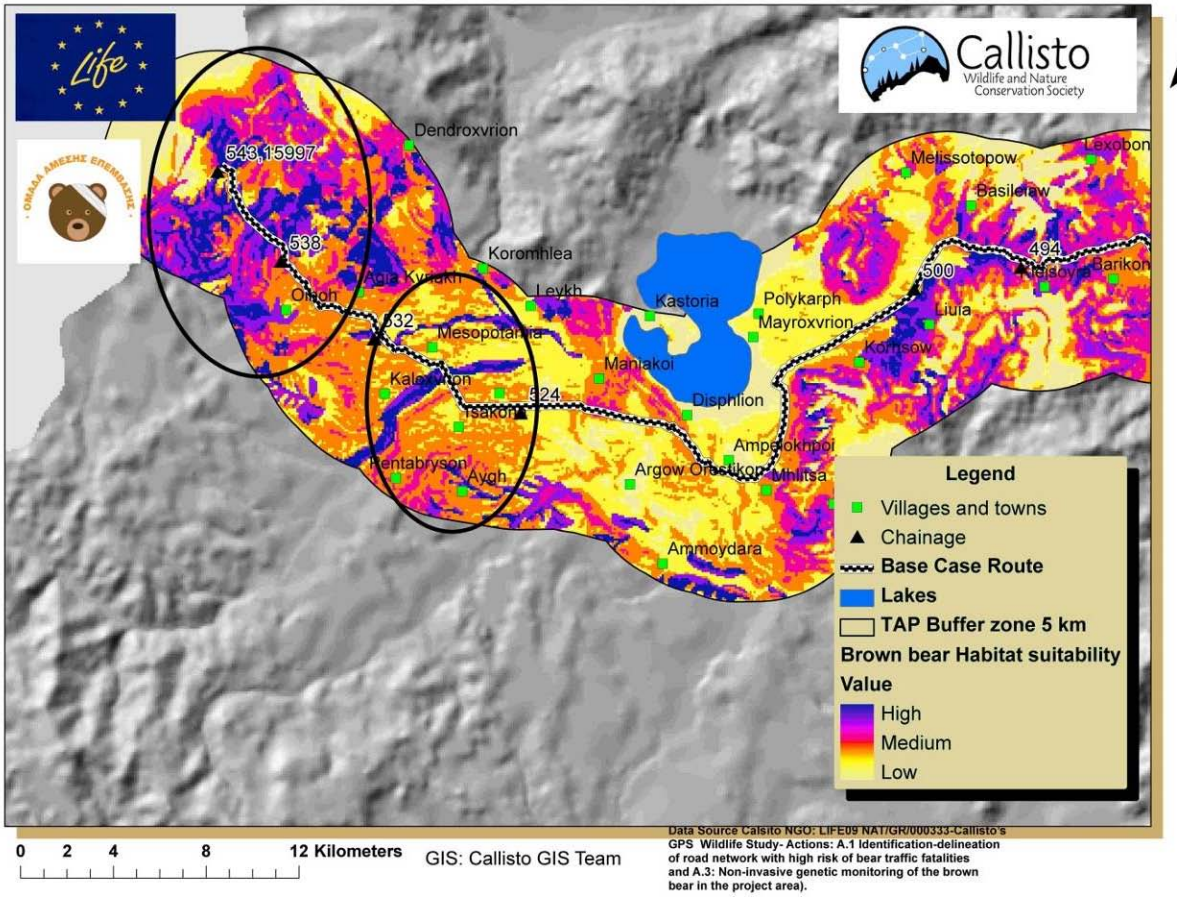
6.3.3.2.18 Kastoria-to-Border

Bear

There was strong evidence (footprints) of frequent use of the riparian forest and the Aliakmonas River basin, between KP 527 and 529, as a functional corridor between larger parts of habitat in adjacent regions but also as a functional habitat itself. The latter was proven by telemetry locations. Although there is no possibility of winter dens in this area, bears may use dense parts of the riparian forest vegetation as daybeds.

Furthermore, bears are present in the area between KP 538 and 543.2 as was clearly indicated by the frequent bear marking on telegraph poles (a sign of reproductive and territorial behaviour), regular use by two radio-collared bears and the high possibility of den sites on either side of the pipeline route. The habitat is of high suitability for bears, especially along the western side of the pipeline alignment.

Figure 6-79 Bear Habitat Suitability in Kastoria to Border Area

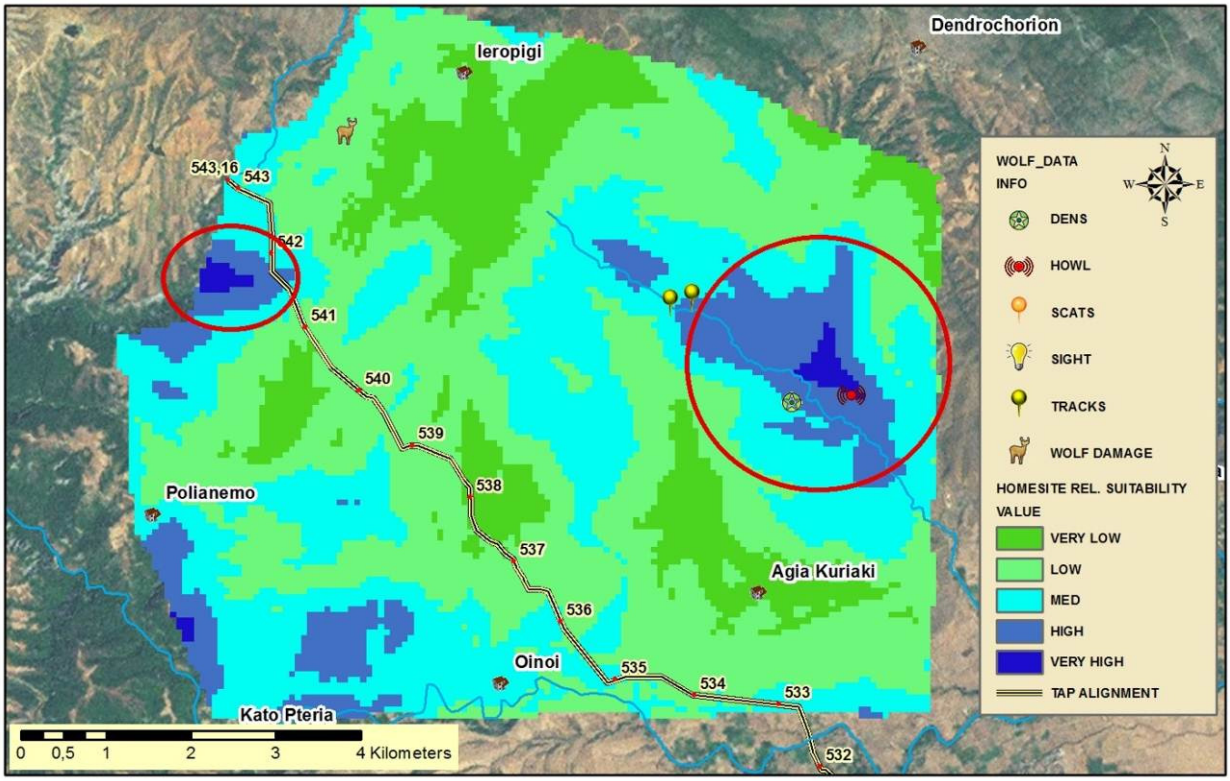


Source: NGO "Callisto" (Environmental Organisation for wildlife and nature) GIS Team (October 2011)

Wolf

In the Kastoria-to-border area, two potential wolf reproduction sites were predicted through data analysis (refer to *Figure 6-80*). The first one is located north of the KP 533 to 534segment in a forested valley with few roads and permanent water. The second highly suitable area is located southeast of the KP 542 to 543.2 segment, to the east of the route and north of the village of Polyanemo.

Figure 6-80 Wolf Homesite Relative Suitability and Wolf Presence at Ieropigi-Oinoe Pass



Source: ERM (2012). Figure produced by Iliopoulos (2011).

<u>European Ground Squirrel</u>

The species has been reported from lake Kastoria district but there are neither recent records with confidence nor any recording during the July 2011 field survey.

6.3.3.2.19 Other Mammals within the Study Area

The otter is known to inhabit major wetland systems in the area but no population census has been accomplished. According to data from BulgariaGeorgiev & Stoycheva(2006) in core (i.e. continually used) habitats there could be a maximum of 4 individuals along 30 km of river line or even one resident female per 3-5 km of river. It is expected that a similar situation might prevail in northern Greece as well, with a sparse population with very extensive foraging areas. Indeed, it is unlikely that more than a single individual or a pair forages occasionally at each crossing point hosting a suitable habitat along the pipeline route. In addition these individuals are expected to

move several kilometres away from any particular crossing point on a regular basis as their territory covers several kilometres.

Table 6-65 summarises otter field observations at major watercourse crossings along the pipeline route.

Table 6-65 Otter (*Lutra lutra*) Field Observations at main crossing points along the pipeline route

River Name	***KP***	***Field observations regarding the presence of Lutra lutra along major rivers / streams crossed by the pipeline.***
River Evros	KP 0	Signs of Otter (*Lutra lutra*), presence confirmed
Provatonas canal	KP 0.5	No signs of Otter (*Lutra lutra*) but the species could very well visit the area occasionally moving there from river Evros and the adjacent canals(potential presence)
Fytemata	KP 13.3	No signs of Otter (*Lutra lutra*). Unlikely that the species occurs there when there is no discharge
Erene stream	KP 41.5	No signs of Otter (*Lutra lutra*) but the species may forage there when fish populations are abundant (potential).
Filiouris	KP 77,4	Signs of Otter (*Lutra lutra*), footprints and scats (presence confirmed)
Chionorema (Bosbozis)	KP 98.6	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Aspropotamos	KP 104.1	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Xiropotamos (Kompsatos)	KP 112.8	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Kosinthos (Xanthis)	KP 135.9	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Nestos	KP 153.7	Habitat considered appropriate for otter foraging or even breeding.
Filippoi Channel	KP 220.1	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Aggitis	KP 223.7	Presence of Otter (*Lutra lutra*) confirmed and is to be expected at this site (large quantities of fish; large numbers of fish -prey easily accessible
Tafros Mpelitsa (Kroussovitis)	KP 281.5	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Strymonas	KP 290.3	No signs of Otter (*Lutra lutra*)observedbut potentially present due to good habitat conditions and dense vegetation, which make difficult the investigation of otter signs
Gallikos	KP 354.5	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Axios	KP 370.3	No signs of Otter (*Lutra lutra*) but the species could very well exist and one will expect it here since cover and food are abundant (potential).
Vardarovasi	KP 372.3	No signs of Otter (*Lutra lutra*) but the species could very well exist and one will expect it here since cover and food are abundant (potential)
Canal 66	KP 414.9	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Grammatiko	KP 444	No signs of Otter (*Lutra lutra*). Food resources rather poor.
Koilada	KP 448.2	No signs of Otter (*Lutra lutra*). Food resources (fish) almost non-existing.
Kastoria (Gioli) canal	KP 460.2	No signs of Otter (*Lutra lutra*). Food resources nearly non-existant (no or extremely few fish). A local farmer who was interviewed was aware of the presence of otters “long ago” when fish populations existed in the canal
Aliakmon I	KP 521.3	Otter (*Lutra lutra*) prints present (one individual).
Aliakmon II	KP 528	Otter (*Lutra lutra*) prints and scatt present (one individual).

River Name	***KP***	***Field observations regarding the presence of Lutra lutra along major rivers / streams crossed by the pipeline.***
Aliakmon III (Vrachopotamos)	KP 532.4	Otter (*Lutra lutra*) prints present (one individual).

Source: ERM field survey (October 2012), ASPROFOS field survey (autumn 2012, spring 2013)

Evidence of the presence of rodent species other than *Spermophilus*was recorded in 15 observation points. Small burrow holes (diameter < 6-7cm) were detected in 11 observation points. Due to the old age of the majority of the holes, and also to the difficulty to use the shape and size of the holes as taxonomic criterion for species identification, no further assumptions were made. The observed holes could be attributed to *Microtus spp*, *Rattus spp*, *Apodemus spp*etc. Characteristic piles of fine-grained soil of *Talpa spp* and/or *Microtus spp* were observed in two locations. *Meles meles* (badger) was recorded in two sites.

The presence of *Talpa* (Mammalia: Talpidae) and *Microtus* species have been widely recorded during the field survey for *Spermophilus citellus* in July 2011. Western Macedonia falls within the range of two mole species: *Talpa caeca* (endemic of south Europe) and *Talpa stancovici* (Balkan endemic). Both inhabit deciduous woodlands, meadows and pastures and can be sympatric. Indeed, either of these species[32]or perhaps both are sure to inhabit the Project area but to distinguish between them special features of the skull need to be measured.

The genus *Microtus*is of particular interest: all five (5) species (*Microtus thomasi*, M. *rossiameridionalis, M. subterraneus, M. guentheri, M. felteni*) are recorded from western Macedonia as often being sympatric. The rarest (considered “Endangered” according to the Greek Red Data Book and Data Deficient for IUCN) is Microtus felteni, a Balkan endemic species of which there are only a few records, i.e. some recent ones from Vermio Mountain. Nevertheless, to identify the species a karyological analysis is necessary, as a result only the presence of the genus can be certified along the TAP route.

[32] To differentiate between species, it is necessary to perform chromosomal analysis and skull measurements

Figure 6-81 Potential and confirmed Otter (*Lutra lutra)* presence along TAP route



Source: EXERGIA field survey (June 2011, October 2012)

6.3.3.2.20 Summary findings for baseline sections along the route (jackal, wolf, bear and otter)

Below a summary of the findings for the jackal, wolf, bear and otter is presented (i.e. present, potentially present, high quality habitat). The information is presented along the route starting on the Greek-Turkish border and progressing towards the Greek-Albanian border.

- At KP0 the presence of Otter (*Lutra lutra*) was confirmed at River Evros crossing
- From KP 0 to KP 3, that is the area from the Greek/Turkish border to Kipoi village, the highest density of jackals was recorded
- At Loutros area (KP 24–33) a suitable homesite area with a minimum four (4) wolves was observed.
- From KP 34 to KP 35, south of Anthia village, one jackal territory that seems to be connected with the populations of the rest of Evros delta.
- At Palagia– Kirki (KP 43–62) two wolf packs were observed.
- From KP 73 to 76, between Lofario and Aetolofos, an extended colony of the European Ground Squirrel was found.
- At KP 77,4 the presence of Otter (*Lutra lutra*) was confirmed at Filiouris river
- From KP 117 to KP 126 at the northern part of Vistonida lake, between Dialampi and Frourio 5 jackals groups were detected.
- From KP 150 to KP 159 along Nestos River south of Toxotes village, it is the area with the highest jackal population recorded.
- At KP 153.7 at Nestos River, there was a potential presence of Otter. Habitat considered appropriate for foraging or even breeding
- From KP 183 to 193, at Kavala mountains two packs of wolves were recorded
- At KP 223.7 in Aggitis River the presence of Otter (*Lutra lutra*) was confirmed.
- From KP 282 to KP 295 the jackal populations seem to follow Strymonas River, moving southwards from Kerkini lake to its Delta.
- At KP 290.3 in Strymonas river, Otters (*Lutra lutra*) are potentially present due to good habitat conditions and dense vegetation.
- At Krousia Mountains (KP 295-325) the area seems suitable for wolf habitat and also for large ungulates' habitat.

- From KP 341 to343 at Drymos Village, the presence of the European Ground Squirrel was confirmed.
- From KP 361-369 at Nea Messimvria to Gefyra villages, a minimum of five (5) European Ground Squirrel colonies were detected.
- At KP 370.3 in Axios River, Otters (*Lutra lutra*) are potentially present.
- At KP 372.3 in Vardarovasi River, Otters (*Lutra lutra*) are potentially present.
- From KP 458 to 475 from Maniakio to Galateia villages. This area hosts up to 13 colonies of the European Ground Squirrel.
- In Kleisoura (KP segment 490.2-496.2) strong evidence of bear presence was found in this area during the field survey.
- At KP 521.3 in Aliakmon River the presence of Otter *(Lutra lutra*) was confirmed.
- At the Aliakmonas River area (KP segment 526.7-528.7) strong evidence of bear presence was found in this area during the field survey.
- At KP 528 in Aliakmon River, the presence of Otter (*Lutra lutra*) was confirmed
- At KP 532.4 in Aliakmon River the presence of Otter (*Lutra lutra*) was confirmed
- At the Albanian Borders region (KP segment 538.9-543.2) Bears are present in this area.

6.3.3.3 Birds

The geographical area of Macedonia – Thrace comprises wintering and breeding grounds for several species of conservation concern. In the Study Area many bird species have been recorded, including species that are threatened in Greece, Europe or even globally (Handrinos and Akriotis 1997, BirdLife International 2004, Legakis and Maragou 2009) (see *Annex 6.5.5*). Bird species with unfavorable national conservation status are listed under JMD 37338/1807/E/103/01-09-2010 (B1495) (potential SPA trigger species) or listed at the IUCN Greek red data book of threatened species. European wide assessment of the conservation status of birds within the the Annexes of the Birds Directive, the Annexes of the Bern Convention, and the Appendices of the Bonn convention and continuously updated with BirdLife's Pan European and EU wide assessments.

Regarding the East Section, from the field survey and the available data, the Southern Evros provides habitat for the most bird species of conservation interest along the pipeline route, especially the Loutros forest (KP 28 – 32), which is crossed by the pipeline at its easternmost section. Here at least ten species of conservation interest are likely to be affected by the TAP. These species use the area for frequent roosting or nesting, although for the latter, the specific location of their nests is unknown and indeed might well be outside the corridor zone. All riparian forests, as the one in Nestos river, are also of great importance for birds as breeding areas.

Regarding the West Section, from the field survey and the available data, it is evident that the richest habitat was the riparian forests (Axios river, Vardarovasi, Loudias river, lowlands west of Mount Vermio, west of Lehovo, Aliakmonas River, northwest of Agia Kyriaki, Mesopotamia, Ampelokipoi), while Fagus forests (Mount Vermio, Agia Foteini, NW of Kleisoura, Kleisoura, Verga) and Quercus forests (eastern Mount Vermio, Grammatikon, Mount Vermio north of Agia Foteini, west of Lehovo, west of Kastoria, Loripigi, Kastraki, Kleisoura, Verga), grassland (Kastraki, near Maniaki) and farmland (south of Loutrohorion, Polla near village, near Maniaki, east of Varikon, west of Lehovo, SW of Leropigi, south of Agia Kyriaki, Ampelopikoi, Korystos, Agia Kyriaki, south of Galatia, near Veroia, Loutrohori, Chalkidona, Nea Messimvria) were less rich. The importance of the riparian forests is probably due to the fact that they support not only species that live in the forests themselves, but also species that simply nest there and feed in the adjacent area.

The baseline conditions of birds found along the fourteen sections of the Study Area are described in the following paragraphs. A list of all threatened species potentially present within the study area is included in *Annex 6.5.5* along with the specific results of the field surveys.

6.3.3.3.1 River Evros Section

There are few reports of resident/wintering/breeding populations of taxa of conservation interest at the crossing point with river Evros and the corridor west to KP0. The most important breeding species in the River Evros Section is the Common Kingfisher (*Alcedoatthis)*. Other species of conservation interest recorded within this section are presented in *Table 6-66*.

Table 6-66 Bird Species of Conservation Interest within the River Evros Section

Scientific name	*Common name*	*Records within Project area*	*Anticipated range within Project area*	*Reason of conservation interest*
Alcedo atthis	Common kingfisher	At least one likely resident population at Evros crossing point KP0	At wetlands throughout the project area	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: DD, IUCN: LC
Buteo rufinus	Long-legged Buzzard	1ad (WP118) (KP 7)	Widespread in lowlands, prefer open landscapes with a mixture of agricultural fields with meadows or pastures	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC
Ciconia ciconia	White Stork	69 (WP118) (KP 7), 37(WP119) (KP 3)	Widespread on farmland in association with water resources	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC
Milvus migrans	Black Kite	1 (WP120) (KP 1)	Localized species mainly in Thrace, farmland mixed with riparian or pine forests	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: CR, IUCN: VU
Circus aeruginosus	Western Marsh Harrier	2 (WP120) (KP 1)	Widespread on migration and wintering. Localized to extensive reedbeds at breeding.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC

Notes: VU: Vulnerable, LC: Least Concern, CR: Critical Endangered, DD: Data Deficient.
Source: EXERGIA field survey (October 2012), NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.2 Southern Evros Section

This is the section that crosses part of the Loutros forest, considered as a regional “hotspot” for avifauna due to the number and abundance of bird taxa of conservation interest present throughout the year. Main species observed in the Southern Evros Section are the Black Vulture (*Aegypiusmonachus*), the Golden Eagle (*Aquila chrysaetos*), the Imperial Eagle (*Aquila heliaca)*, the Lesser-spotted Eagle (*Aquila pomarina)*, the Greater-spotted Eagle (*Aquila clanga)*, the Eurasian Eagle Owl (*Bubo bubo),* the Black Stork (*Ciconianigra),* the Short-toed Snake Eagle (*Circaetusgallicus)*, the Syrian Woodpecker (*Dendrocopossyriacus)*, the Griffon Vulture (*Gyps fulvus)* and the Booted Eagle (*Hieraaetus pennatus). Table 6-67* presents all the species of conservational interest recorded in this section.

Table 6-67 Bird Species of Conservation Interest within the Southern Evros Section

Scientific name	*Commonname*	*Records within Project area*	*Anticipated range within Project area*	*Reason of conservation interest*	*General comments*
Aquilla clanga	Greater spotted eagle	Roosting individuals at Loutros forest (KP 28–32)	Throughout the project area	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: VU	15 – 20 pairs reported to winter within the NATURA 2000 site GR 1110009 Potentially roosting on the vicinity of the pipeline route
Aegypius monachus	Black vulture	Roosting individuals at Loutros forest (KP 28–32), 1 (WP109), 1 (WP111)	Evros and eastern Rodopi districts	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: NT, IUCN: EN	The breeding colony lies within the Dadia national park far outside the project area but part of the project area lies within the home range of breeding and non-breeding individuals
Aquila heliaca	Imperial eagle	Roosting individuals at Loutros forest (KP 28–32)	Throughout the project area during foraging/wintering/migration	2009/147/EC: Annex I, SPEC 1, IUCN: VU	4 – 6 pairs reported to winter within the NATURA 2000 site GR 1110009, potentially in the vicinity of the pipeline
Aquila pomarina	Lesser Spotted Eagle	1ad (WP109)	Scarce breeder mainly in the lowlands. Breeds in forests close to water resources as wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	Nests potentially in the vicinity of the pipeline route
Accipitridae: *Bubo bubo*	Eurasian Eagle Owl	Breeding population at Loutros forest (KP 28–32)	Fragmented populations at mountains/ravine	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	3 – 4 pairs reported to breed within the NATURA 2000 site GR 1110009 (year 1997)
Picidae: *Dendrocopossyriacus*	Syrian woodpecker	(AV-22, KP 28– 29) (AV-2, KP 45– 46),	Forested land	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Possible breeding territories at Pefka (AV-22, KP 28– 29) and at Palagia (AV-2, KP 45– 46)

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Gyps fulvus	Griffon vulture	Roosting individuals at Loutros forest (KP 28–32)	Rare	2009/147/EC: Annex I, RDB-Greece: NT	One breeding colony (13 pairs min) at Karapetra (Mavropetra) hills (2009 data), approx. 10 kms north/ northeast of the corridor.
Haliaeetus albicilla	White-tailed eagle	One breeding pair at Loutros forest, south of KP 29, outside the 2km zone.	Rare	2009/147/EC: Annex I, Bern Convention II, Bonn Convention I/II, CITES I, RDB-Greece: CR, IUCN: LC	
Ciconia nigra	Black stork	4 – 7 breeding pairs at the pine forest north of Loutros village 1 (WP109), 3 (WP110), 1 (WP111), 2 (WP116)	Localized on patches of forests in agricultural landscapes in association with water resources (rivers, lakes etc)	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: LC	Potential nesting site in the pine forest around between KP 29 and 32, close to the pipeline route
Circaetus gallicus	Short-toed Eagle	4 (WP101), 2 (WP108), 1 (WP112), 1 (WP113),	Widespread to a variety of habitats. Breeds mainly on coniferous and deciduous forests.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NT, IUCN: LC	Widespread in several areas outside the pipeline zone
Lullula arborea	Wood Lark	1 (WP98)(25m) 1 (WP99)(50m) 1 (WP101)(80m) 2 (WP104)(80m) 2 (WP112) (80m) 1 (WP113)(100m)	Widespread resident in forested landscapes with openings or mixed with pastures	2009/147/EC: Annex I, RDB-Greece: LC, IUCN: LC	Low densities of the species recorded along the pipeline route in optimal habitats.
Buteo rufinus	Long-legged Buzzard	1ad (WP111), 1ad (WP117)	Widespread in lowlands, prefer open landscapes with a mixture of agricultural fields with meadows or pastures	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Coracias garrulus	European Roller	1pair (WP115), 1bird (WP117)	Localized breeder prefers lowland open countryside with patches of forest	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece:VU, IUCN: NT	A breeding pair at KP 19.5 was observed appr.190m from the pipeline.
Ciconia ciconia	White Stork	13 (WP111), 9 (WP116), 69 (WP118), 37 (WP119) Observed in Autumn: 2a.8, 2b.10	Widespread on farmland in association with water resources	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone
Milvus migrans	Black Kite	1ad (WP108), 4 (WP116)	Localized species mainly in Thrace, farmland mixed with riparian or pine forests	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: CR, IUCN: VU	
Calandrella brachydactyla	Greater Short-toed Lark	1 (WP115)(50m)	Widespead during migration and fairly common in breeding season in optimal habitat.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	
Falco vespertinus	Red-footed Falcon	1 (WP114)	Widespread during migration	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: VU	Widespread in several areas outside the pipeline zone
Circus aeruginosus	Western Marsh Harrier	1ad (WP103), 1ad (WP108), 1ad (WP114)	Widespread on migration and wintering. Localized to extensive reedbeds at breeding.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Hippolais olivetorum	Olive-tree Warbler	2 (WP113)(80m)	Fairly common breeder in pastures or non intensive arable land in association with scattered trees	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: NT, IUCN: LC	
Lanius collurio	Red-backed Shrike	1 (WP98)(50m), 1 (WP112)(50m), 1 (WP113)(80m)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Accipiter brevipes	Levant Sparrowhawk	9 (WP111)	Widespread in riverine forests or poplar plantations usually close to water resources	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NE, IUCN: LC	
Hieraaetus pennatus	Booted Eagle	1ad (WP111)	Fairly widespread in migration, localized breeder on coniferous, deciduous or mixed forests	2009/147/EC: Annex II/2, Bern Convention III, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	A territorial adult at KP 29.4. Potential nesting site in the pine forest around this point.
Emberiza caesia	Cretzschmar's Bunting	1 bird (WP104)	Localized breeder in Northern Greece to phrygana or lowland pastures. Common species in phrygana to Southern Greece and Aegean islands.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Falco peregrinus	Peregrine	1 (WP99)	Widespread	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: LC, IUCN: LC	

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Pernis apivorus	European Honey Buzzard	1ad (WP99)	Mainly broadleaved forests (Quercus spp, Fagus spp)	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES I/A, RDB-Greece: LC, IUCN: LC	

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, CR: Critical Endangered, EN: Endangered, NE: Not Evaluated
Source: EXERGIA field survey (October 2012), NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.3 Lowlands of Evros Section

Lullula arborea and perhaps other passerines favouring shrubland and cultivations have hold-ons within this section. A potential nesting site for the Levant Sparrowhawk (*Accipiter brevipes)* and a small colony of the European-Bee Eater (*Merops apiaster*) have been found in this section. *Table 6-68* presents the species of conservation interest observed in the Lowlands of Evros Section, were themostrelevant species found are the Common Kingfisher (*Alcedoatthis*) and the Short-toed Snake Eagle (*Circaetusgallicus)* and the Western Marsh Harrier *(Circus aeruginosus).*

Table 6-68 Bird Species of Conservation Interest Present in Lowlands of Evros Section

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason ofconservationinterest***	***General comments***
Alcedo atthis	Common Kingfisher	At least one likely resident population at Filiouris crossing point	Wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: DD, IUCN: LC	
Circaetus gallicus	Short-toed snake eagle	Likely to be present at hilly areas south of Sykorachi, Kirki and Avas	Fragmented populations at mountains/shrublands/forests	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NT, IUCN: LC	
Lullula arborea	Wood Lark	1 (WP96)(80m) (KP96)	Widespread resident in forested landscapes with openings or mixed with pastures	2009/147/EC: Annex I, RDB-Greece: LC, IUCN: LC	Low densities of the species recorded along the pipeline route in optimal habitats.

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason ofconservationinterest***	***General comments***
Lanius collurio	Red-backed Shrike	1 (WP91(50m) (KP81), 2 (WP16)(1:25m,1:80m) 1 (WP96)(50m)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Circus aeruginosus	Western Marsh Harrier	1ad (WP95) (KP62),	Widespread on migration and wintering. Localized to extensive reedbeds at breeding.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone
Accipiter brevipes	Levant Sparrowhawk	1ad(WP91) (KP81),	Widespread in riverine forests or poplar plantations usually close to water resources	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NE, IUCN: LC	Potential nesting site in close distance from the working strip
Ciconia ciconia	White Stork	1(WP91) (KP81),	Widespread on farmland in association with water resources	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone
Merops apiaster	European Bee-eater	Colony at WP91 (KP81),.	Widespread in agricultural land. Suitable nesting sites (sandbanks) are a strong limiting factor for its distribution.	Bern Convention II, Bonn Convention II, RDB-Greece: NE, IUCN: LC	A small colony of 4-7 pairs found at a stream at KP 81.7. Special attention should be paid to the identified colony

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, NE: Not Evaluated, DD: Data Deficient.
Source: EXERGIA field survey (October 2012), NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.4 Komotini – Xanthi Plain Section

Along this section, species of conservation interest have been observed only on the pipeline sections crossing the Hatisio wildlife refuge (KP 98 – 100), the Kompsatos River (KP 114– 116)

and the Nestos River KotzaOrman forest (KP153 - 156). These species are presented in *Table 6-69*.

Table 6-69 Bird Species of Conservation Interest Present in Komotini – Xanthi Plain Section

Scientific name	*Common name*	*Records within Project area*	*Anticipated range within Project area*	*Reason of conservation interest*	*General comments*
Picidae: *Dendrocopossyriacus*	Syrian woodpecker	Resident populations at Hatisio (KP 98 – 100), Kompsatos (KP 114 – 116) Nestos (KP 153 – 156) 1 (WP67)(100m) 2 (WP72)(100m) 2 (WP86)(50m), 1 (WP87)(100m)	Common and widespread resident in forest patches, orchards, or agricultural land with scattered trees	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	
Haliaeetus albicilla	White-tailed Eagle	Observed in Autumn: 2c.11	Known to breed in the National Park of Nestos and possibly in SPA GR1130009	2009/147/EC: Annex I, Bern Convention II, Bonn Convention I/II, CITES I, RDB-Greece: CR, IUCN: LC	
Lanius collurio	Red-backed Shrike	Observed in staging/migration at Kompsatos (KP 114 – 116), KotzaOrman (Nestos) (KP 153 – 156) Several Sightings at 80-100 m from pipe route (WP68, WP71,WP75, WP76,WP84, WP86, WP88, WP90)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Lanius minor	Lesser grey shrike	Observed in staging/migration at Kompsatos (KP 114 – 116), KotzaOrman (Nestos) (KP 153 – 156) 1 (WP79)(100m), 2 (WP86)(50m), 2 (WP89)(120m)	Widespread and fairly common breeder in non intensive arable land in association with poplar plantations, riverine forests or scattered trees.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NT, IUCN: LC	Tree nesting, Meadows with bare ground, arable land pastureland, grassland (breeding). This species has no nest-fidelity meaning that usually it builds a nest per breeding season.
Accipiter brevipes	Levant Sparrowhawk	1ad (WP73), 1ad (WP74), (KP153),	Widespread in riverine forests or poplar plantations usually close to water resources	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NE, IUCN: LC	

Scientific name	***Common name***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Acrocephalus melanopogon	Moustached Warbler	1 (WP70)(80m) (KP159)	Reedbeds in wetlands or inland lakes. Rare breeder, fairly common during winter.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	Potential breeding site within optimal habitat (mixture of old and new reedbeds with permanent water throughout the whole year).
Anthus campestris	Tawny Pipit	1 (WP90)(50m)	Widespread bur scarce breeder. Prefer dry sandy pastures	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Aquila pomarina	Lesser Spotted Eagle	Observed in Autumn:2a.8	Scarce breeder mainly in the lowlands. Breeds in forests close to water resources as wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	A displaying adult bird (territorial behaviour) observed. Potential nesting site in the vicinity of the working strip
Ardea purpurea	Purple Heron	1 (WP78)	Wetlands or along rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: VU	
Burhinus oedicnemus	Stone-Curlew	Observed in Autumn: 2a.4	Fairly common on arid landscapes usually close to rivers. More frequent to water resources in post breeding season and migration	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES I, RDB-Greece: NT, IUCN: LC	Probably widespread in several areas outside the pipeline route.
Calandrella brachydactyla	Greater Short-toed Lark	1 (WP84)(150m) (KP136)	Widespread during migration and fairly common in breeding season in optimal habitat.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	
Ciconia ciconia	White Stork	1 (WP67) (KP168), 1 (WP69) (KP159), 2 (WP80) (KP125), Observed in Autumn: 2a.8, 2b.10	Widespread on farmland in association with water resources	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone

Scientific name	***Common name***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Ciconia nigra	Black Stork	2 (WP74) (KP153), 1 (WP80) (KP125),	Localized on patches of forests in agricultural landscapes in association with water resources (rivers, lakes etc)	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: LC	
Circaetus gallicus	Short-toed Eagle	Observed in Autumn:2a.8, 2b.4	Widespread to a variety of habitats. Breeds mainly on coniferous and deciduous forests.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NT, IUCN: LC	Widespread in several areas outside the pipeline zone
Circus aeruginosus	Western Marsh Harrier	1ad (WP84) (KP110), Observed in Autumn: 2a.4, 2a.8, 2b.10	Widespread on migration and wintering. Localized to extensive reedbeds at breeding.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone
Egretta garzetta	Little Egret	1 bird (WP4), 1 (WP83) (KP112), Observed in Autumn: 2a.4, 2b.10	Wetlands or along rivers	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Falco naumanni	Lesser Kestrel	9 birds (WP88) (KP93), 1,6km south	Known to breed in few colonies in Komotini's plain	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: VU	
Hieraaetus pennatus	Booted Eagle	1ad (WP87) (KP97)	Fairly widespread in migration, localized breeder on coniferous, deciduous or mixed forests	2009/147/EC: Annex II/2, Bern Convention III, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	
Larus melanocephalus	Mediterranea Gull	72 birds (WP83) (KP112), 2(WP84) (KP110)	Widespread during migration. Localized breeder on large wetlands	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: LC	

Scientific name	*Common name*	*Records within Project area*	*Anticipated range within Project area*	*Reason of conservation interest*	*General comments*
Merops apiaster	European Bee-eater	Colony found. in WP83 (KP112)	Widespread in agricultural land. Suitable nesting sites (sandbanks) are a strong limitation factor for its distribution.	Bern Convention II, Bonn Convention II, RDB-Greece: NE, IUCN: LC	A former medium sized (10 - 20 holes) breeding colony found in Kompsatos river, in close distance from the pipeline. Attention should be paid to the colony observed
Philomachus pugnax	Ruff	5 birds (WP65) (KP171)	Saltmarshes or freshwater wetlands in shallow water.	2009/147/EC: Annex I, Bern Convention III, Bonn Convention II, IUCN: LC	
Riparia riparia	Sand Martin	more than 15 birds (WP78) (KP136), more than 5 birds (WP83) (KP112)	Locally common in freshwater or brackish wetlands also in rivers	Bern Convention II, RDB-Greece: NE, IUCN: LC	A former medium sized (40 - 50 holes) breeding colony found in Kompsatos river, in close distance to the pipeline. Attention should be paid to the colony observed

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, EN: Endangered, NE: Not Evaluated
Source: NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.5 Kavala Mountains Section

Within the Kavala Mountains Sections species of conservation interest have been observed only on the AgiosTimotheos – Kioupia wildlife refuge (KP 187– 191). These species ara the Red-backed Shrike (*Laniuscollurio*) and the European Honey Buzzard (*Pernisapivorus*) (*Table 6-70)*.

Table 6-70 Bird Species of Conservation Interest Present in KavalaMountains Section

scientific name	*Commonname*	*Records within Project area*	*Anticipated range within Project area*	*Reason of conservation interest*	*General comments*
Lanius collurio	Red-backed Shrike	Observed in staging/migration at AgiosTimotheos – Kioupia (KP 187 – KP191) 1(Wp60)(50m), 1(Wp62)(100m),	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Pernis apivorus	European Honey Buzzard	Observed in staging/migration at AgiosTimotheos – Kioupia (KP 187 – KP191) 1ad(Wp63)	Mainly broadleaved forests (Quercus spp, Fagus spp)	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES I/A, RDB-Greece: LC, IUCN: LC	

Notes: LC: Least Concern, NE: Not Evaluated
Source: NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.6 Filippoi Plain Section

The field surveys conducted do not show records of significant breeding populations of bird species of conservation interest in this section of the corridor.However the presence of Long-legged Buzzard (*Buteo ruffinus*) and the widespread in farmland during migration *Lanius* sp. has been recorded (*Table 6-71*).

Table 6-71 Bird Species of Conservation Interest Present in Filippoi Plain Section

Scientific name	*Commonname*	*Records within Project area*	*Anticipated range within Project area*	*Reason ofconservationinterest*	*General comments*
Buteo rufinus	Long-legged Buzzard	1ad(Wp48) (KP 227), 1ad (Wp49) (KP 223)	Widespread in lowlands, prefer open landscapes with a mixture of agricultural fields with meadows or pastures	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	
Lanius collurio	Red-backed Shrike	1(Wp46)(100m) (KP 223), 1(Wp48)(50m) (KP 227), 1(Wp52)(100m) (KP 214)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May

Scientific name	Commonname	Records within Project area	Anticipated range within Project area	Reason ofconservationinterest	General comments
Lanius minor	Lesser Grey Shrike	1(Wp52)(100m) (KP 214)	Widespread and fairly common breeder in non intensive arable land in association with poplar plantations, riverine forests or scattered trees.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NT, IUCN: LC	

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, NE: Not Evaluated
NCC field survey (May 2013) see Annex 6.5.5

6.3.3.3.7 Serres Plain Section

The field surveys conducted in May 2013 revealed a potential nesting site for the Black Stork (*Ciconia nigra*) (near KP 238), a very dense population of Calandra Lark (*Melanocorypha calandra)* (KP 227 to 228 north of Wildlife Refugee-Aistrati Petroto) and the presence of a breeding pair of European Roller (*Coracias garrulus*) 140m near the proposed pipeline routing at KP 281 (Provatas area) as the main avifauna features of this section. Additional species of conservation interest where observed, as presented in *Table 6-72*.

Table 6-72 Bird Species of Conservation Interest Present in Serres Plain Section

Scientific name	Commonname	Records within Project area	Anticipated range within Project area	Reason of Conservation interest	General comments
Anthus campestris	Tawny Pipit	1 bird (WP48)(80m) (KP227)	Widespread bur scarce breeder. Prefer dry sandy pastures	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Aquila pomarina	Lesser Spotted Eagle	1 (WP29) (KP290)	Scarce breeder mainly in the lowlands. Breeds in forests close to water resources as wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	
Buteo rufinus	Long-legged Buzzard	1(WP48) (KP227)	Widespread in lowlands, prefer open landscapes with a mixture of agricultural fields with meadows or pastures	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	
Calandrella brachydactyla	Greater Short-toed Lark	1 bird (WP32)(100m) (KP288)	Widespead during migration and fairly common in breeding season in optimal habitat.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of Conservation interest***	***General comments***
Ciconia ciconia	White Stork	3 birds (WP32) (KP288), 1 (WP34) (KP281), 3 (WP40) (KP261), 1 (WP42) (KP248)	Widespread on farmland in association with water resources	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	Widespread in several areas outside the pipeline zone
Ciconia nigra	Black Stork	1 bird (WP44) (KP238)	Localized on patches of forests in agricultural landscapes in association with water resources (rivers, lakes etc)	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: LC	Observed in streams hosting habitat considered as very suitable for breeding Potential nesting site in the streams at KP 237-238
Circaetus gallicus	Short-toed Eagle	1ad (WP31) (KP290) 1 (WP38) (KP268)	Widespread to a variety of habitats. Breeds mainly on coniferous and deciduous forests.	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NT, IUCN: LC	Widespread in several areas outside the pipeline zone
Coracias garrulus	European Roller	1pair (WP35)	Localized breeder prefers lowland open countryside with patches of forest	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece:VU, IUCN: NT	A breeding pair in KP 80.5 was observed about140m from the pipeline route. Potential nesting site in the vicinity of the pipeline working strip
Dendrocopos syriacus	Syrian Woodpecker	1 (WP29)(80m) (KP 290) 1 (WP41)(50m) (KP254)	Common and widespread resident in forest patches, orchards, or agricultural land with scattered trees	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	
Emberiza hortulana	Ortolan Bunting	1 (WP44)(50m) (KP238)	Fairly common species, breeds in non intensive arable land rich in bushes or mixed with forest patches.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Falco peregrinus	Peregrine	1 (WP48) (KP227)	Widespread	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: LC, IUCN: LC	
Falco vespertinus	Red-footed Falcon	1(WP40) (KP261)	Widespread during migration	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: VU	Widespread in several areas outside the pipeline zone

Scientific name	Commonname	Records within Project area	Anticipated range within Project area	Reason of Conservation interest	General comments
Lanius collurio	Red-backed Shrike	1(WP29)(120m) (KP290), 1(WP41)(25m) (KP254), 1(WP46)(100m) (KP233), 1(WP48)(50m) (KP27)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Lanius minor	Lesser Grey Shrike	1(WP45)(100m) (KP237)	Widespread and fairly common breeder in non intensive arable land in association with poplar plantations, riverine forests or scattered trees.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NT, IUCN: LC	
Melanocorypha calandra	Calandra Lark	7(WP47)(2:25m, 2:50m,3:100m) (KP228), 2 (WP48)(100m) (KP227)	Widespread during winter and migration. Localized breeder in areas with non intensive arable land or dry, stony pasture.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	Extremely high breeding density of the species in KP 228. Optimal habitat betweenKP 227and 230 Confirmed sensitive breeding activity in the area.

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, EN: Endangered, NE: Not Evaluated
Source: NCC field survey (May 2013) see Annex 6.5.5

6.3.3.3.8 Kroussia Mountains Section

Along the pipeline route in the Kroussia Mountains sections, several species of conservation have been recorded (*Table 6-73*), specially within the crossing of the national park of Koronia – Volvi (KP 312– 329). The most important feature observed has been a potential home range of the Lesser Spotted Eagle (*Aquila pomarina*), near KP 325.

Table 6-73 Bird Species of Conservation Interest Present in KroussiaMountains Section

Scientific name	Commonname	Records within Project area	Anticipated range within Project area	Reason of conservation interest	General comments
Lullula arborea	Wood Lark	WP15, (KP 321) WP16, (KP 319) WP21, (KP 307) WP22, (KP 306) WP25, (KP 304) WP26 (KP301) All <100 m from pipe	Widespread resident in forested landscapes with openings or mixed with pastures	2009/147/EC: Annex I, RDB-Greece: LC, IUCN: LC	Low densities of the species recorded along the pipeline route in optimal habitats.

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Dendrocopos syriacus	Syrian Woodpecker	Observed in Autumn: 7.9(KP322)	Common and widespread resident in forest patches, orchards, or agricultural land with scattered trees	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	
Lanius collurio	Red-backed Shrike	Observed in staging/migration at the National Park of Koronia – Volvi (KP 318 – 351)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Lanius minor	Lesser Grey Shrike	Observed in staging/migration at the National Park of Koronia – Volvi (KP 318 – 351)	Widespread and fairly common breeder in non intensive arable land in association with poplar plantations, riverine forests or scattered trees.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NT, IUCN: LC	Tree nesting, Meadows with bare ground, arable land pastureland, grassland (breeding). This species has no nest-fidelity meaning that usually it builds a nest per breeding season.
Accipiter brevipes	Levant Sparrowhawk	Observed in Autumn: 7.12 (KP315)	Widespread in riverine forests or poplar plantations usually close to water resources	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: NE, IUCN: LC	
Aquila pomarina	Lesser Spotted Eagle	1 (WP14) (KP325)	Scarce breeder mainly in the lowlands. Breeds in forests close to water resources as wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: EN, IUCN: LC	A displaying adult bird (territorial behaviour) observed in KP 326. Potential nest in the vicinity of the working strip
Emberiza hortulana	Ortolan Bunting	1 bird (WP20)(50m) (KP310)	Fairly common species, breeds in non intensive arable land rich in bushes or mixed with forest patches.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: LC, IUCN: LC	
Falco vespertinus	Red-footed Falcon	1ad (WP14) (KP325)	Widespread during migration	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: VU	Widespread in several areas outside the pipeline zone

Notes: VU: Vulnerable, LC: Least Concern, NT: Near Threatened, EN: Endangered, NE: Not Evaluated
Source: NCC field survey (September 2012 and May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.9 Gallikos Plain Section

Main area of interest within this section with regards to avifauna is located on the crossing of the National Park of Koronia – Volvi (KP 318– 351). In addition a breeding territory of the Long-Legged Buzzard was recorded between KP 354 and 357. *Table 6-74* presents the species of conservation interest observed in the Gallikos Plain Section.

Table 6-74 Bird Species of Conservation Interest Present within Galllikos plain section

Scientific name	***Commonname***	***Records within Project area***	***Anticipated range within Project area***	***Reason ofConservationinterest***	***General comments***
Buteo rufinus	Long-legged Buzzard	1 (WP2) (KP356)	Widespread in lowlands, prefer open landscapes with a mixture of agricultural fields with meadows or pastures	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, CITES II/A, RDB-Greece: VU, IUCN: LC	A breeding territory was found in the area from KP 357 to 354. Northeast from Kp 354 a suitable nesting site observed 200 to 300m from the pipeline route.
Ardea purpurea	Purple Heron	1 bird (WP4) (KP354)	Wetlands or along rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: EN, IUCN: VU	
Ardeola ralloides	Squacco Heron	1 bird (WP4) (KP354)	Wetlands and rivers	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	
Lanius collurio	Red-backed Shrike	Observed in Autumn: 7.12 (KP315)	Widespread and common breeder in a variety of habitats except intensive arable land.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: NE, IUCN: LC	Widespread in several areas outside the pipeline zone. Peak of migration in Northern Greece: Early May
Larus minutus	Little Gull	1 bird (WP4) (KP354)	Widespread during migration	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: NE, IUCN: LC	
Melanocorypha calandra	Calandra Lark	3 birds (WP10)(50m) (KP332), 1 bird (WP12)(100m) (KP329)	Widespread during winter and migration. Localized breeder in areas with non intensive arable land or dry, stony pasture.	2009/147/EC: Annex I, Bern Convention II, RDB-Greece: VU, IUCN: LC	
Phalacrocorax pygmeus	Pygmy Cormorant	4 birds (WP4) (KP354)	Along rivers	2009/147/EC: Annex I, Bern Convention II, Bonn Convention II, RDB-Greece: LC, IUCN: LC	

Scientific name	*Commonname*	*Records within Project area*	*Anticipated range within Project area*	*Reason ofConservationinterest*	*General comments*
Tringa glareola	Wood Sandpiper	25 birds (WP4) (KP354)	Saltmarshes or freshwater wetlands in shallow water.	2009/147/EC: Annex I, Bern Convention III, Bonn Convention II, IUCN: LC	

Notes: VU: Vulnerable, LC: Least Concern, EN: Endangered, NE: Not Evaluated
Source:NCCfield survey (September 2012, May 2013) and bibliographic data as mentioned in Annex 6.5.5

6.3.3.3.10 Axios Plain Section

Table **6-75** presents the most important species observed in the Axios Plain: White Stork (Ciconia ciconia), Black Stork (Ciconia nigra), Short-toed Eagle (Circaetus gallicus) and Kestrel (Falco tinnunculus). As it is obvious by the tabulated data, none of these species need further consideration or special mitigation measures except for the Short-toed Eagle that will possibly need further consideration during the construction period.

Table 6-75 Bird Species of Conservation Interest Present on Axios Plain

Family name Latin name	***Common name***	***Records within Project area*** *(distance (m) from route centreline)*	***Anticipated range within Project area***	***Reason of Conservation interest***	***General comments***
Ciconiidae, Ciconia ciconia	White Stork	WP 6cp (20 m)	Probably in many areas in farmland and near wetlands	SPEC 2, VU in Greece	Seen also in areas outside the route
Ciconiidae, Ciconia nigra	Black stork	Several points around Axios river	Unknown but unlikely to nest in the vicinity of Axios River crossing point	EN in Greece	
Coraciidae Coracias garrulus	roller	Several points around Axios river	Unknown	NT (IUCN) VU in Greece	
Accipitridae, Circaetus gallicus	Short-toed Eagle	WP 58 (20 m)	Presumably widespread	SPEC 3, NT in Greece	Nests may possibly occur within working strip
Falconidae, Falco tinnunculus	Kestrel	WP 58 (20 m), WP 4cp (120 m), WP 10 (210 m), WP 5cp (200 m), WP 6cp (20 m)	Widespread	SPEC 3	Many observations also outside the route
Meropidae, Merops apiaster	Bee-eater	WP 1cp (60 m), WP 5cp (200 m)	Probably widespread in lowlands near rivers	SPEC 3	Seen also outside the route

*Notes: * during the pre-construction / post-construction Project period,*
SPEC: Species of European Conservation Concern, NT: Near Threatened, VU: Vulnerable
Source: ERM field surveys (June 2011 and May 2012)

6.3.3.3.11 Vermio Mountain Slopes Section

The most important species observed in this section of the proposed pipeline route was the Short-toed Eagle (*Circaetus gallicus*) (see *Table 6-76*). However, this species does not require further consideration or special mitigation measures in this area because no evidence of nesting sites were observed along the working strip.

Table 6-76 Bird Species of Conservation Interest Present on the Vermio Mountain Slopes

Family name Latin name	***Common name***	***Records within Project area*** *(distance (m) from route centreline)*	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Meropidae, *Merops apiaster*	Bee-eater	WP 17cp (20 m)	Probably widespread in lowlands near rivers	SPEC 3	Seen also outside the route
Accipitridae, *Circaetus gallicus*	Short-toed Eagle	Several sightings in beech forest	unknown	SPEC 3, NT in Greece	

*Notes: * during the pre-construction / post-construction Project period,*
SPEC: Species of European Conservation Concern, VU: Vulnerable

Source: ERM field surveys (June 2011 and May 2012)

6.3.3.3.12 Ptolemaida Basin Section

The most important species observed in the Ptolemaida Basin was the Short-toed Eagle (*Circaetus gallicus*) (*Table 6-77*) which will possibly need further consideration during the construction period.

Table 6-77 Bird Species of Conservation Interest Present in the Ptolemaida Basin

Family name Latin name	***Common name***	***Records within Project area*** *(distance (m) from route centreline)*	***Anticipated range within Project area***	***Reason of conservation interest***	***General comments***
Falconidae, *Falco naumannii*	Lesser Kestrel	Wider area (near Komnina)	Known to breed in farmland east of Chimaditis Lake	IUCN- VU, SPEC 1, VU in Greece	Not observed on the route
Accipitridae, *Circaetus gallicus*	Short-toed Eagle	WP 14cp (0 m)	Presumably widespread	SPEC 3, NT in Greece	Uncertain if nesting near working strip
Meropidae, *Merops apiaster*	Bee-eater	WP 25 (20 m) , WP 15cp (60 m	Probably widespread in lowlands near rivers	SPEC 3	Seen also outside the route
Pelecanidae, *Pelecanus crispus*	Dalmatian Pelican	WP 22 (20 m)	Mainly in the lakes of the area	IUCN- VU, SPEC 1, VU in Greece	
Laniidae, *Lanius senator*	Woodchat Shrike	WP 22 (20 m)	Probably fairly widespread	SPEC 2	-
Falconidae, *Falco tinnunculus*	Kestrel	WP 26 (40 m) , WP 15cp (60 m)	Widespread	SPEC 3	Many observations also outside the route

*Notes: * during the pre-construction / post-construction Project period,*
SPEC: Species of European Conservation Concern, VU: Vulnerable

Source: ERM field surveys (June 2011)

6.3.3.3.13 Askion Mountain Slopes Section

The most important species observed along the Askion Mountain slopes section are presented in *Table 6-78*: Dalmatian Pelican (*Pelecanus crispus*), Bee-eater (*Merops apiaster*), Wheatear (*Oenanthe oenanthe*) and Eastern Bonelli's Warbler (*Phylloscopus orientalis*). However none of them need further consideration or special mitigation measures.

Table 6-78 Bird Species of Conservation Interest Present along the Askion Mountain Slopes

Family name Latin name	*Common name*	*Records within Project area (distance (m) from route centreline)*	*Anticipated range with in Project area*	*Reason of Conservation interest*	*General comments*
Pelecanidae, *Pelecanus crispus*	Dalmatian Pelican	WP 31 (50 m)	Mainly in the lakes of the area	IUCN- VU, SPEC 1, VU in Greece	Flying high
Turdidae, *Oenanthe oenanthe*	Wheatear	WP 31 (50 m)	Presumably widespread	SPEC 3	-
Falconidae, *Falco tinnunculus*	Kestrel	WP 29 (70 m)	Widespread	SPEC 3	Many observations also outside the route
Sylviidae, *Phylloscopus orientalis*	Eastern Bonelli's Warbler	WP 31 (50 m), WP 44 (40 m)	Deciduous upland forests	SPEC 2 (as *Phylloscopus bonelli*)	-

*Notes: * during the pre-construction / post-construction Project period,*
SPEC: Species of European Conservation Concern, VU: Vulnerable

Source: ERM field surveys (June 2011)

6.3.3.3.14 Kastoria-to-Border Section

The most important species observed in the Kastoria-to-border area are presented in *Table 6-79.* Most of the species observed in this area do not need further consideration or special mitigation measures, except for the Montagu's Harrier (*Circus pygargus*) which will potentially need further attention.

The discovery of breeding Montagu's Harriers near Agia Kyriaki village is by far the most important finding of this study. A pair was observed and its nest was located right on the route, while another female was observed in the area, indicating the presence of another pair. This species is classified as Critically Endangered (CR) in The Red Book of Threatened Animals of Greece (Legakis and Maragou, 2009) and in the past, the species was recorded as nesting near Olympia, Galatia and Vegora towns.

Table 6-79 Bird Species of Conservation Interest Present in the Kastoria-to-Border Area

Family name Latin name	*Common name*	*Records within Project area (distance (m) from route centreline)*	*Anticipated range within Project area*	*Reason of conservation interest*	*General comments*
Phasianidae, Coturnix coturnix	Quail	WP 35 (40 m), WP 48 (160 m)	Widely in farmland/ grassland	SPEC 3	Probably more widespread than indicated
Phalacrocoracidae, Phalacrocorax pygmaus	Pygmy Cormorant	Wider area (Lake Kastoria)	Lakes and rivers	SPEC 1	Not recorded on the route
Pelecanidae, Pelecanus onocrotalus	White Pelican	Wider area (Lake Kastoria)	Mainly in lakes	SPEC 3, VU in Greece	Not recorded
Ciconiidae, Ciconia ciconia	White Stork	WP 50 (170 m)	Probably in farmland and near wetlands	SPEC 2, VU in Greece	Seen also outside the route
Accipitridae, Circus pygargus	Montague's Harrier	WP 39 (130 m), WP 48 (160 m)	Farmland south of Olympia and Galatia and near Vegora, possibly elsewhere	CR in Greece	At least one nest right on the route
Falconidae, Falco tinnunculus	Kestrel	WP 50 (170 m)	Widespread	SPEC 3	Many observations also outside the route
Sylviidae, Hippolais pallida	Olivaceus Warbler	Observed in several WPs	Fairly widespread	SPEC 3	

*Notes: * during the pre-construction / post-construction Project period,*
SPEC: Species of European Conservation Concern, CR: Critical Endangered, VU: Vulnerable

Source: ERM field surveys (June 2011)

6.3.3.3.15 Summary of Avifauna Key Findings

Main sites and areas of concern for different avifauna species identified along the pipeline route during the field survey are presented below, in a sequence from *East* to *West*. For additional information please refer to *Annex 6.5.5*.

- Crossing of Loutros forest roosting area (KP 28-32). This area is of special interest for raptors.
- *Riparia riparia:* Former colonies with high possibility of being reused at KP112.5 to 113 near the Kompsatos River crossing point.
- *Merops apiaster:* Former colonies with high possibility of reuse at KP112.5 to 113 near the Kompsatos River crossing point.

- *Coracias garullus*: Nests recorded at KP112.5 to 113 near the Kompsatos crossing.
- *Accipiter brevipes:* breeding area at KP 153.4 to 154.2 south to Nestos River crossing with a nest being recorded 80m from the proposed pipeline route.
- *Ciconia nigra:* feeding area at KP 153.4 to 154.2 south to Nestos River crossing.
- *Aquila pomarina*: likely (but uncertified) to breed in KP 153 – 156, Kotza Orman forest around Nestos River.
- *Circus aeroginosus:* feeding area at KP 159.5 to 159.8 south to Nestos river crossing.
- *Acrocephalus melanopogon:* potential nesting site at KP 158.9 to 159.8 south to Nestos river crossing.
- *Melanocorypha calandra*: Breeding of at least 7 pairs at KP 227-230 south of Alistrati.
- *Buteo rufinus*: Feeding area at KP 227-230 south of Alistrati.
- *Falco Peregrinus*: Feeding area at KP 227-230 south of Alistrati.
- *Ciconia nigra:* Riparian forest along streams with high probability of black stork nesting between KP 236.4 to 238.5, near Leukothea.
- *Falco subbuteo:* Breeding pair at KP 268 south to Neochorion.
- *Coracias garullus* Breeding pair at KP 280.6 150m north of the pipeline routing at Serres Plain
- *Aquila pomarina*: possible breeding at KP 290 to 290.6 at 500m south to pipeline near Stimonas river crossing.
- *Aquila pomarina*: Confirmed breeding pair at KP 323.5 to 327.5 at North-west edge of the Koroni-Volvi National Park
- *Buteo rufinus*: Breeding pairatKP 350.5 – 355.5 near the Gallikos upstream crossing (Gallikos plain).
- *Circaetus gallicus*: Potentially nesting in the vicinity of the working strip at KP 368 Northwest of Gefyra, close to Axios River crossing.
- *Circaetus gallicus*: Potentially nesting in the vicinity of the working strip at KP 368 Northwest of Gefyra, close to Axios River crossing.
- *Circus pygargus*: At least one nest close to the pipeline route at KP 537 south of Agia Kyriaki.

6.3.3.4 Amphibians and Reptiles

The results presented below were obtained from extensive literature reviews supported and ground truthed by field surveys in selected areas along the pipeline route (see also *Annex 6.5.6).* There are 22 amphibian species in Greece (approximately a third of all European species). 13 taxa are estimated to be present in the Study Area (Valakos et al., 2008) and most of them widely distributed. Available data on reptiles in the Study Area is sparse and the area remains insufficiently studied in this respect. However, some information exists with regards to the species richness of the Prespa region, which is approximately 15 km north of the westernmost portion of the route, in which relatively high reptile species richness has been recorded (24 species per 10 km).

Ten species of amphibians (i.e. 84% of expected species) and seventeen reptile species (i.e. 59% of expected species) were observed along the pipeline route. Despite the limitations of the field study (see *Annex 6.5.6*) based on observations throughout the field trip and taking into account the related literature (including sampling problems that are common in the case of tortoises), it can be stated that the presence of tortoises lie within the values that have been previously reported in similar studies from Mediterranean countries (Rouag et al., 2007 and references therein; Fernández-Chacón et al., 2011). Additionally, new taxa, such as the Balkan wall lizard (*Podarcis tauricus*) and the Green lizard (*Lacerta viridis*), that were never reported before from the western part of Study Area were observed during the different field study visits.

The following subsections describe the baseline conditions of amphibians and reptiles that were found along the 14sections of the Study Area, while a comprehensive list of observed and expected amphibians and reptiles is cited in Annex 6.5.6.

6.3.3.4.1 River Evros Section

There are no reports of amphibian and reptile species of conservation interest from the pipeline project area crossing the River Evros Section. However, their presence is not discarded, especially in the vicinity of the Evros River.

6.3.3.4.2 Southern Evros Section

During the field study in the Southern EvrosSection,3 species of amphibian and reptiles (Marsh Frog, Mediterranean spur-thighed Tortoise, Green lizard) were observed, all of them under protection status and most of them considered as abundant (see *Table 6-80*).

Table 6-80 Amphibian and Reptilian Species Present on the Southern Evros Section

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Pelophylax ridibundus (Ranidae)	Marsh Frog	AR19	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Testudo graeca (Testudinidae)	Mediterranean spur-thighed Tortoise	AR18, AR20	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Lacerta viridis (Lacertidae)	Green lizard	AR25, AR30	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance

Source: EXERGIA and NCC field surveys (October 2012 and April-May 2013 respectively)

6.3.3.4.3 Lowlands of Evros Section

During the field study in the Lowland of Evros Section, 8 species of amphibian and reptiles (Marsh Frog, Hermann's tortoise, Mediterranean Spur-thighed tortoise, Balkan terrapin, Three-lined lizard, Green lizard, Caspian whip snake, Grass snake) were observed, all of them under protection status with some of them being abundant in the area (see *Table 6-81*).

Table 6-81 Amphibian and Reptilian Species Present on the Lowland of Evros Section

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Pelophylax ridibundus (Ranidae)	Marsh Frog	AR34, AR35, AR37, AR38	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Testudo hermanni (Testudinidae)	Hermann's tortoise	AR38	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), Vulnerable species according to the Greek Red Data Book	
Testudo graeca (Testudinidae)	Mediterranean spur-thighed tortoise	AR34, AR38	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Mauremys rivulata (Geoemydidae)	Balkan terrapin	AR36, AR38	Water bodies like lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Lacerta trilineata (Lacertidae)	Three-lined lizard	AR37	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Lacerta viridis (Lacertidae)	Green lizard	AR33, AR35	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Dolichophis caspius (Colubridae)	Caspian whip snake	AR33	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	
Natrix natrix (Colubridae)	Grass snake	AR34, AR38	Lakes, small rivers and ponds in low and middle elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	In good frequency near water bodies.

Source: EXERGIA and NCC field surveys (October 2012 and April-May 2013 respectively)

6.3.3.4.4 Komotini – Xanthi Plain Section

During the field study in the Komotini-Xanthi Plain Section, 16 species of amphibian and reptiles (Green toad, Yellow-bellied toad, Common tree frog, Greek marsh frog, Marsh Frog, Smooth newt, Hermann's tortoise, Mediterranean Spur-thighed tortoise, Balkan terrapin, European pond terrapin, European glass lizard, Green lizard, Caspian whip snake, Montpellier snake, Grass snake, Dice snake) were observed, all of them under protection status with some showing high abundance in the area (see *Table 6-82*).

Table 6-82 Amphibian and Reptilian Species Present on the Komotini-Xanthi Plain Section

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Bufo viridis (Bufonidae)	Green toad	R-40, R-42, R-54	Should occur alongside the routing, in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	Nocturnal species.Tadpoles were found and 3 males were identified by their voices.
Bombina variegata (Bombinatoridae)	Yellow-bellied toad	R-51, R-54	Present in small water bodies (e.g. ponds) in middle and high elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive	
Hyla arborea (Hylidae)	Common tree frog	R-51	Should occur alongside the routing, in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	Tadpoles where located
Pelophylax kurtmuelleri (Ranidae)	Greek marsh frog	R-39, R-40, R-41, R-42, R-43, R-45, R-46	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Pelophylax ridibundus (Ranidae)	Marsh Frog	R-47, R-50, R-51, R-54, R-57, R-60, R-63	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Lissotriton vulgaris (Salamandridae)	Smooth newt	R-54	Should be present in ponds, small streams and rivulets in low, middle and high elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Testudo hermanni (Testudinidae)	Hermann's tortoise	R-38, R-46, R-51, R-52, R-60	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), Vulnerable species according to the Greek Red Data Book	
Testudo graeca (Testudinidae)	Mediterranean spur-thighed tortoise	R-42, R-43, R-52, R-53, R-59, R-60	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Mauremys rivulata (Geoemydidae)	Balkan terrapin	R-39, R-42, R-43, R-44, R-47, R-50	Water bodies like lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Emys orbicularis (Emydidae)	European pond terrapin	R-42, R-46	Water bodies like lakes, small rivers, swamps and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), The species is listed as "near threatened" in the IUCN Red Data Book	
Pseudopus apodus (Anguidae)	European glass lizard	R-43	Open areas, cultivated fields, maquis, bush lands and grasslands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	In good frequency
Lacerta viridis (Lacertidae)	Green lizard	R-39, R-40, R-41, R-42, R-43, R-44, R-45, R-46, R-56, R-59, R-60, R-62, R-63	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Dolichophis	Caspian whip	R-40	Grasslands,	Appendix II of the	

Family name Latin name	Common name	Records Within Project area	Expected habitats within Project area	Reason of conservation interest	General comments
caspius (Colubridae)	snake		maquis, phrygana, cultivated fields, rocky areas and bush lands	Bern Convention, Annex IV of the EU Natural Habitats Directive	
Malpolon insignitus (Colubridae)	Montpellier snake	R-44, R-57	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	
Natrix natrix (Colubridae)	Grass snake	R-39, R-40, R-41, R-42, R-50, R-51, R-54, R-57	Lakes, small rivers and ponds in low and middle elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	In good frequency near water bodies.
Natrix tessellata (Colubridae)	Dice snake	R-5, R-39, R-40	Lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	

Source: NCC field surveys (April-May 2013)

6.3.3.4.5 Kavala Mountains Section

During the field study in the Kavala Mountains Section, 7 species of amphibian and reptiles (Green toad, Hermann's tortoise, Mediterranean Spur-thighed tortoise, European glass lizard, Three-lined lizard, Green lizard, Snake-eyed Lizard) were observed, all of them under protection status with some showing high abundance in the area (see *Table 6-83*).

Table 6-83 Amphibian and Reptilian Species Present on the Kavala Mountains Section

Family name Latin name	Common name	Records Within Project area	Expected habitats within Project area	Reason of conservation interest	General comments
Bufo viridis (Bufonidae)	Green toad	R-37	Should occur alongside the routing, in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	Nocturnal species.Tadpoles were found and 3 males were identified by their voices.

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Testudo hermanni (Testudinidae)	Hermann's tortoise	R-33, R-38	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), Vulnerable species according to the Greek Red Data Book	
Testudo graeca (Testudinidae)	Mediterranean spur-thighed tortoise	R-36, R-38	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Pseudopus apodus (Anguidae)	European glass lizard	R-33, R-34, R-36, R-37, R-38	Open areas, cultivated fields, maquis, bush lands and grasslands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	In good frequency
Lacerta trilineata (Lacertidae)	Three-lined lizard	R-38	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Lacerta viridis (Lacertidae)	Green lizard	R-34	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Ophisops elegans (Lacertidae)	Snake-eyed Lizard	R-37, R-38	Open areas, sparse grasslands, bush lands and rocky hillsides.	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	

Source: NCC field surveys (April-May 2013)

6.3.3.4.6 Filippoi Plain Section

During the field study in the Filippoi Plain Section, 5 species of amphibian and reptiles (Greek marsh frog, European pond terrapin, Green lizard, Balkan wall lizard, Caspian whip snake and Grass snake) were observed, all of them under protection status with some showing high abundance in the area (see *Table 6-84*).

Table 6-84 Amphibian and Reptilian Species Present on the Filippoi Plain Section

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Pelophylax kurtmuelleri (Ranidae)	Greek marsh frog	R-24, R-27, R-28, R-29, R-32	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Emys orbicularis (Emydidae)	European pond terrapin	R-28	Water bodies like lakes, small rivers, swamps and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), The species is listed as “near threatened” in the IUCN Red Data Book	
Lacerta viridis (Lacertidae)	Green lizard	R-27, R-31, R-32	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Dolichophis caspius (Colubridae)	Caspian whip snake	R-31	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	
Natrix natrix (Colubridae)	Grass snake	R-32	Lakes, small rivers and ponds in low and middle elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	In good frequency near water bodies.

Source: NCC field surveys (April-May 2013)

6.3.3.4.7 Serres Plain Section

During the field study in the Serres Plain Section, 12 species of amphibian and reptiles (Green toad, Yellow-bellied toad, Greek marsh frog, Hermann's tortoise, Mediterranean Spur-thighed tortoise, Balkan terrapin, European pond terrapin, Green lizard, Caspian whip snake, Montpellier snake, Grass snake, Nose-horned viper) were observed, all of them under protection status with some showing high abundance in the area (see *Table 6-85*).

Table 6-85 Amphibian and Reptilian Species Present on the Serres Plain Section

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Bufo viridis (Bufonidae)	Green toad	R-20, R-21	Should occur alongside the routing, in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	Nocturnal species.Tadpoles were found and 3 males were identified by their voices.
Pelophylax kurtmuelleri (Ranidae)	Greek marsh frog	R-10, R-11, R-12, R-14, R-16, R-20, R-21, R-24	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Testudo hermanni (Testudinidae)	Hermann's tortoise	R-20, R-21, R-24	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), Vulnerable species according to the Greek Red Data Book	
Testudo graeca (Testudinidae)	Mediterranean spur-thighed tortoise	R-20, R-23	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Mauremys rivulata (Geoemydidae)	Balkan terrapin	R-20	Water bodies like lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Emys orbicularis (Emydidae)	European pond terrapin	R-10, R-11, R-12, R-14, R-16	Water bodies like lakes, small rivers, swamps and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), The species is listed as "near threatened" in the IUCN Red Data Book	
Lacerta viridis (Lacertidae)	Green lizard	R-10, R-11, R-12, R-13, R-21, R-24	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Podarcis tauricus (Lacertidae)	Balkan wall lizard	R-17	Open areas, forest meadows and grasslands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Dolichophis caspius (Colubridae)	Caspian whip snake	R-11	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	
Malpolon insignitus (Colubridae)	Montpellier snake	R-12	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	
Natrix natrix (Colubridae)	Grass snake	R-10, R-11, R-12	Lakes, small rivers and ponds in low and middle elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	In good frequency near water bodies.
Vipera ammodytes (Viperidae)	Nose-horned viper	R-23	Rocky areas, grasslands, maquis and phrygana	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	

Source: NCC field surveys (April-May 2013)

6.3.3.4.8 Kroussia Mountains Section

During the field study in the Kroussia Mountains Section, 11 species of amphibian and reptiles (Common toad, Greek marsh frog, Fire salamander, Hermann's tortoise, Balkan terrapin, Green lizard, Erhard's wall lizard, Montpellier snake, Grass snake, Dice snake, Nose-horned viper) were

observed, all of them under protection status with some showing high abundance in the area (see *Table 6-86*).

Table 6-86 Amphibian and Reptilian Species Present on the Kroussia Mountains Section

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Bufo bufo (Bufonidae)	Common toad	R-7	Should occur alongside the routing, in low and middle elevations in areas with dense vegetation	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	
Pelophylax kurtmuelleri (Ranidae)	Greek marsh frog	R-5, R-7	Should occur in streams, rivers, rivulets and ponds, in low and middle elevations	Appendix III of the Bern Convention, Annex V of the EU Natural Habitats Directive	In abundance
Salamandra salamandra (Salamandridae)	Fire salamander	R-6	Should occur in middle and high elevation forests, close to small river and rivulets	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	Only larvae have been found, most probably because of the time of the fieldwork since the species is nocturnal.
Testudo hermanni (Testudinidae)	Hermann's tortoise	R-1, R-2, R-3, R-4, R-6, R-7, R-8, R-9	Open areas and forest meadows	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981), Vulnerable species according to the Greek Red Data Book	
Mauremys rivulata (Geoemydidae)	Balkan terrapin	R-5	Water bodies like lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annexes II and IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Lacerta viridis (Lacertidae)	Green lizard	R-1, R-1, R-2, R-3, R-4, R-6, R-7, R-8, R-9	Open areas, bush lands, forest meadows and sparse forests	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	In abundance
Podarcis erhardii (Lacertidae)	Erhard's wall lizard	R-5	Rocky areas, slopes and dry stone walls	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Malpolon insignitus (Colubridae)	Montpellier snake	R-4	Grasslands, maquis, phrygana, cultivated fields, rocky areas and bush lands	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	
Natrix natrix (Colubridae)	Grass snake	R-5	Lakes, small rivers and ponds in low and middle elevations	Appendix III of the Bern Convention, National Legislation (Presidential Decree 67/1981)	In good frequency near water bodies.
Natrix tessellata (Colubridae)	Dice snake	R-5	Lakes, small rivers and ponds in low and middle elevations	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive, National Legislation (Presidential Decree 67/1981)	
Vipera ammodytes (Viperidae)	Nose-horned viper	R-4, R-8	Rocky areas, grasslands, maquis and phrygana	Appendix II of the Bern Convention, Annex IV of the EU Natural Habitats Directive	

Source: NCC field surveys (April-May 2013)

6.3.3.4.9 Gallikos Plain Section

There are no records of amphibian and reptile species of conservation interest from the pipeline project area crossing the Gallikos Plain Section.

6.3.3.4.10 Axios Plain Section

During the field survey in the Axios Plain section, no species of amphibian orreptilewere observed within the 500 m buffer zone.

6.3.3.4.11 Vermio Mountain Slopes Section

During the field survey on the Vermio Mountain slopes section, 11 species of amphibian and reptiles (Yellow-bellied toad, Greek marsh frog, Greek brown frog, Fire salamander, Hermann's tortoise, Mediterranean spur-thighed tortoise, Balkan terrapin, Three-lined lizard, Green lizard, Common wall lizard, Grass snake) were observed. All of these species are protected and,

according to available literature, most are not known to have declining populations in Greece (*Table 6-87*).

Table 6-87 Amphibian and Reptilian Species Present on the Vermio Mountain Slopes

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Discoglossidae *Bombina variegata*	Yellow-bellied toad	12,13, 14,17	in small water bodies in middle and high elevations	Bern Convention, 92/43/EC	In abundance,
Ranidae *Pelophylax kurtmuelleri*	Greek marsh frog	14,6,7, 13	in streams, rivers and rivulets in low and middle elevations	Bern Convention 92/43/EC	In abundance
Ranidae *Rana graeca*	Greek brown frog	15	in streams, rivers and rivulets in low and middle elevations	Bern Convention 92/43/EC PD 67/1981	Reported in low densities in W. Macedonia
Salamandridae *Salamandra salamandra*	Fire salamander	14,15	in middle and high elevation forests, close to small river and rivulets	Bern Convention PD 67/1981	Only larvae have been found
Testudinidae *Testudo hermanni*	Hermann's tortoise	14,13	in open areas and forest meadows	Bern Convention 92/43/EC, PD 67/1981 Vulnerable species (Greek Red Data Book)	In good frequency
Testudinidae *Testudo graeca*	Mediterranean spur-thighed tortoise	4,10,14, 17,15	in open areas and forest meadows	Bern Convention 92/43/EC PD 67/1981	
Geoemydidae *Mauremys rivulata*	Balkan terrapin	6,7,29	in water bodies like lakes, small rivers and big ponds in low and middle elevations	Bern Convention 92/43/EC PD 67/1981	In abundance in standing and polluted water
Lacertidae *Lacerta trilineata*	Three-lined lizard	4,6,7,10, 12,17,15, 19,28,29	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae *Lacerta viridis*	Green lizard	4,6, 7, 10,12,17,15 , 19,28,29	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae *Podarcis muralis*	Common wall lizard	4,6,7,10, 12,17,19	in rocky areas, meadows, foothills and bush lands	Bern Convention 92/43/EC PD 67/1981	In abundance
Colubridae *Natrix natrix*	Grass snake	6,7,10,24	in lakes, rivers and ponds in low and middle elevations	Bern Convention PD 67/1981	

Source: ERM field surveys (June 2011)

6.3.3.4.12 Ptolemaida Basin Section

During the field survey along the Ptolemaida Plain section, 4 species of amphibian and reptiles (Balkan terrapin, Three-lined lizard, Green lizard and Common wall lizard) were observed. All of these species are protected and, according to available literature, are not known to have declining populations in Greece (*Table 6-88*).

Table 6-88 Amphibian and Reptilian Species Present on the Ptolemaida Plain

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Geoemydidae Mauremys rivulata	Balkan terrapin	30	in water bodies like lakes, small rivers and big ponds in low and middle elevations	Bern Convention 92/43/EC PD 67/1981	In abundance in standing and polluted water
Lacertidae Lacerta trilineata	Three-lined lizard	30, 32, 33, 34	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Lacerta viridis	Green lizard	30, 32, 33, 34	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Podarcis muralis	Common wall lizard	31	in rocky areas, meadows, foothills and bush lands	Bern Convention 92/43/EC PD 67/1981	In abundance

Source: ERM field surveys (June 2011)

6.3.3.4.13 Askion Mountain Slopes Section

During the field study along the Askion Mountain slopes section, 6 species of amphibian and reptiles (Hermann's tortoise, Three-lined lizard, Green lizard, Common wall lizard) were observed. All of these species are protected and have abundant populations (*Table 6-89*).

Table 6-89 Amphibian and Reptilian Species Present on the Askion Mountain Slopes

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Testudinidae Testudo hermanni	Hermann's tortoise	35, 36	in open areas and forest meadows	Bern Convention 92/43/EC PD 67/1981, vulnerable species (Greek Red Data Book)	In good frequency
Lacertidae Lacerta trilineata	Three-lined lizard	36, 48	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Lacerta viridis	Green lizard	36, 48	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Testudinidae Testudo graeca	Mediterranean spur-thighed tortoise	47, 49	in open areas and forest meadows	Bern Convention 92/43/EC PD 67/1981)	
Lacertidae Podarcis muralis	Common wall lizard	35, 36, 48, 49	in rocky areas, meadows, foothills and bush lands	Bern Convention 92/43/EC PD 67/1981	In abundance
Colubridae Dolichophis caspius	Caspian whip snake	47	in grasslands, maquis, phrygana and bush lands	Bern Convention	In good frequency

Source: ERM field surveys (June 2011)

6.3.3.4.14 Kastoria-to-Border Section

During the field study along the Kastoria-to-Border section, 10 species of amphibian and reptiles (Yellow-bellied toad, Greek marsh frog, Hermann's tortoise, Mediterranean spur-thighed tortoise, Balkan terrapin, Three-lined lizard, Green lizard, Common wall lizard, Balkan wall lizard, Caspian whip snake) were observed. All of these species are protected and, according to available literature, are not known to have declining populations in Greece (*Table* **6-90**).

Table 6-90 Amphibian and Reptilian Species Present in the Kastoria-to-Border Area

Family name Latin name	*Common name*	*Records Within Project area*	*Expected habitats within Project area*	*Reason of conservation interest*	*General comments*
Discoglossidae Bombina variegata	Yellow-bellied toad	43	present in small water bodies (e.g. ponds) in middle and high elevations	Bern Convention 92/43/EC	In abundance
Ranidae Pelophylax kurtmuelleri	Greek marsh frog	46	should occur in streams, rivers and rivulets in low and middle elevations	Bern Convention 92/43/EC	In abundance
Testudinidae Testudo hermanni	Hermann's tortoise	44	in open areas and forest meadows	Bern Convention 92/43/EC PD 67/1981 Vulnerable (Greek Red Data Book)	In good frequency

Family name Latin name	***Common name***	***Records Within Project area***	***Expected habitats within Project area***	***Reason of conservation interest***	***General comments***
Testudinidae Testudo graeca	Mediterranean spur-thighed tortoise	45	in open areas and forest meadows	Bern Convention 92/43/EC PD 67/1981)	
Geoemydidae Mauremys rivulata	Balkan terrapin	43	in water bodies like lakes, small rivers and big ponds in low and middle elevations	Bern Convention 92/43/EC PD 67/1981	In abundance in standing and polluted water
Lacertidae Lacerta trilineata	Three-lined lizard	39, 46	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Lacerta viridis	Green lizard	39, 46	in open areas, bush lands, forest meadows and sparse forests	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Podarcis muralis	Common wall lizard	43, 44, 46	in rocky areas, meadows, foothills and bush lands	Bern Convention 92/43/EC PD 67/1981	In abundance
Lacertidae Podarcis tauricus	Balkan wall lizard	44, 46	in open areas, forest meadows and grasslands	Bern Convention 92/43/EC PD 67/1981	
Colubridae Dolichophis caspius	Caspian whip snake	44, 46	in grasslands, maquis, phrygana and bush lands	Bern Convention	In good frequency

Source: ERM field surveys (June 2011)

6.3.3.4.15 Summary of Amphibians and Reptiles

The lowlands of the West Section are considered to have poor species richness however the mountainous sites, wetlands and rivers present greater richness. With the exception of the tortoise Testudo hermanni and the BalkanCrestedNewt (Trituruskarelinii) no other species from the study area are included in the Greek Red Data book.

Overall the field survey indicates that within the Project area there are no “hotspots” for taxa of conservational interest for either reptiles or amphibians with regards to species richness or abundance. However, ponds and streams found along the pipeline route could be considered as the habitat of main importance for herpetofauna.

6.3.3.5 Aquatic Ecology

This Section is dedicated to the main species that occur on the crossing points of rivers/streams within the TAP project study area, which are freshwater benthic macroinvertebrates, freshwater

ichthyofauna and freshwater diatoms. These elements, together with the condition of the riparian vegetation and landscape contribute to establish the quality status of the rivers in the area based on ecological parameters. It also provides detailed data on several ecological features of the stream and riparian environment at the crossing points in order to provide a full picture of the river ecological status at the pipeline crossing points.In addition, it provides standardised information on the watercourses' ecological status as required by the Water Framework Directive (2000/60/EC).

In line with the Water Framework Directive (WFD), the following elements have been analysed:

- Hydro-morphology
- Water quality
- Sediments
- Aquatic Ecology
    - Habitats and flora
    - Phytobenthos (Diatoms)
    - Macroinvertebrates
    - Fishes

The presented data are based on field surveys performed in the major water bodies crossed by the project. Details of the field surveys and the results are presented in *Annex 6.5.7* for hydrobiology and *Annex 6.5.8* for diatoms.

Table 6-91 shows the most relevant crossing points along the pipeline route.

Table 6-91 Main River Crossing points along the pipeline route

River/Stream	*Section*	*Crossing point (KP)*
Evros	River Evros	0.0
Provatonas	River Evros	0.6
Fytemata	River Evros	13.4
Apokrimno (Erene)	Southern Evros	41.4
Filiouris	Lowlands of Evros	77.4
Chionorema	Komotini – Xanthi Plain	98.5
Aspropotamos	Komotini – Xanthi Plain	104.1
Xiropotamos (Kompsatos)	Komotini – Xanthi Plain	112.8
Kosinthos (Xanthis)	Komotini – Xanthi Plain	135.9
Nestos	Komotini – Xanthi Plain	153.7
Taffros Aggitis	Filippoi Plain	220.1

River/Stream	*Section*	*Crossing point (KP)*
Aggitis	Filippoi Plain	223.7
Krousovitis (Tafros Mpelitsa)	Serres Plain	281.5
Strymonas	Serres Plain	290.3
Gallikos	Gallikos Plain	354.5
Axios	Axios Plain	370.3
Vardarovasi	Axios Plain	372.3
Canal 66	Axios Plain	414.9
Grammatiko	Vermio Mt. Slopes	444.0
Kilada	Vermio Mt. Slopes	448.2
Kastro Stream	Vermio Mt. Slopes	460.2
Kastoria (Gioli) canal	Kastoria to Border	513.0
Aliakmonas I	Kastoria to Border	521.3
Aliakmonas II	Kastoria to Border	528.0
Aliakmonas III (Vrachapotamos)	Kastoria to Border	532.4

Source:ASPROFOS (2013), ERM (2013)

The key findings of a comprehensive literature review and field study are described below, while a more detailed report is included in the respective *Annex 6.5.7* of the ESIA.

6.3.3.5.1 Macroinvertebrates

Regarding the East Section, sampling of benthic macroinvertebrates took place[33] at eleven out of the fifteen crossing points, and specimens were identified into the family level. The sampled specimens belonged to 44 invertebrate families. The abundance found per sample varied from 846 (Evros) to 70 (Apokrimno), whereas the diversity fluctuated from the 19 families (Kosinthos) to 6 (Krousovitis). The molluscs included the gastropods *Lymnaeidae*, *Sphaeriidae, Physidae* and *Planorbidae*, and the bivalvia *Unionidae*. The leeches belonged to *Eprobdellidae* and *Glossiphonidae*. Arthropods included the arachnids *Argyronetidae*; the crustaceans *Gammaridae* and *Asselidae*; the hemipterans *Gerridaeand, Corixidae*, *Notonectidae* and *Pleidae*; the caddis-flies *Hydropsychidae, Hydroptilidae* and *Psychomyiidae*; the may-flies *Heptageniidae, Baetidae*, *Caenidae*, *Ephemeridae*, and *Potamanthidae*; the true-flies *Anthomyiidae*, *Chironomidae*, *Limoniidae*, *Simuliidae*, *Stratiomyidae*, *Tabanidae* and *Tipulidae*; the dragon-flies *Calopterygidae*, *Cordulogastridae, Libellulidae, Gomphidae, Coenagrionidae* and *Platycnemididae*; the beetles *Dytiscidae, Hydarenidae, Elmidae* and *Hydrophilidae*; the stoneflies *Leuctridae*, the Lepidoptera

[33] Rivers Aggitis and Nestos were not sampled due to difficulties in access at the crossing point, streams/canals Xiropotamos and Fyetematawere found dry during the field survey period.

Pyralidae and the annelids *Tubificidae* and *Lumbricidae*. However, species sensitive to pollution, i.e. from the orders of Plecoptera, Trichoptera and Ephemeroptera, were very limited due to pollution.

In the West Section, ten rivers or canals were sampled and a large number of benthic macroinvertebrates (13,783) were sorted from the samples and identified to family level, with the exception of Oligochaeta. The sampled specimens belonged to 50 invertebrate families. The abundance found per sample varied from 7,345 to 214, whereas the diversity fluctuated from 4 families to 21. Apart from Oligochaeta the rest of the Annelida taxa included *Erpobdellidae, Glossiphoniidae, Hirudinidae* and *Piscicolidae*. The molluscs included *Ancylidae, Bithyniidae, Lymnaeidae, Physidae, Planorbidae, Unionidae* and *Valvatidae*. Arthropods included the arachnids *Argyronetidae*, the crustaceans *Gammaridae* and *Asselidae*, the hemipterans *Aphelocheiridae* and *Corixidae,* the stone-flies *Leuctridae* and *Perlidae*, the caddis-flies *Glossosomatidae*, *Hydropsychidae*, *Hydroptilidae*, *Lepidostomatidae*, *Leptoceridae*, *Limnephilidae*, *Polycentropodidae* and *Rhyacophilidae*, the may-flies *Baetidae, Caenidae, Ephemerellidae, Heptageniidae* and *Oligoneuriidae*, the true-flies*Athericidae*, *Ceratopogonidae, Chironomidae, Limoniidae, Simuliidae, Stratiomyidae, Tabanidae* and*Tipulidae*, the dragon-flies*Calopterygidae, Coenagrionidae, Gomphidae* and *Platycnemididae*, and the water beetles *Dytiscidae, Elminthidae, Haliplidae, Hydraenidae, Hydrophilidae* and *Scirtidae*.

The Hellenic Evaluation System (HES), was corrected for the sampled habitat quality with the Greek Habitat Richness Matrix and was used in order to assess the water quality according to the macroinvertebrate freshwater fauna. HES (Artemiadou & Lazaridou, 2005) is based on the composition of the benthic macroinvertebrate community since it composes an ideal biological index for monitoring river water quality, mainly because macroinvertebrate are in position to give time-integrated information concerning disturbances due to pollution (perennial or episodic) whereas chemical analyses stand for instantaneous results. HES uses a five class quality interpretation scale (excellent, good, moderate, poor, very poor) taking into consideration the relative abundance of benthic macroinvertebrates and is standardized against the habitat diversity richness (e.g. substrate) according to Greek Habitat River Matrix (Chatzinikolaou et al. 2006)[34].

[34] Retrieved on 07.06.2013 from http://www.bio.auth.gr/river/LabRivers/eng_assessement.htm,

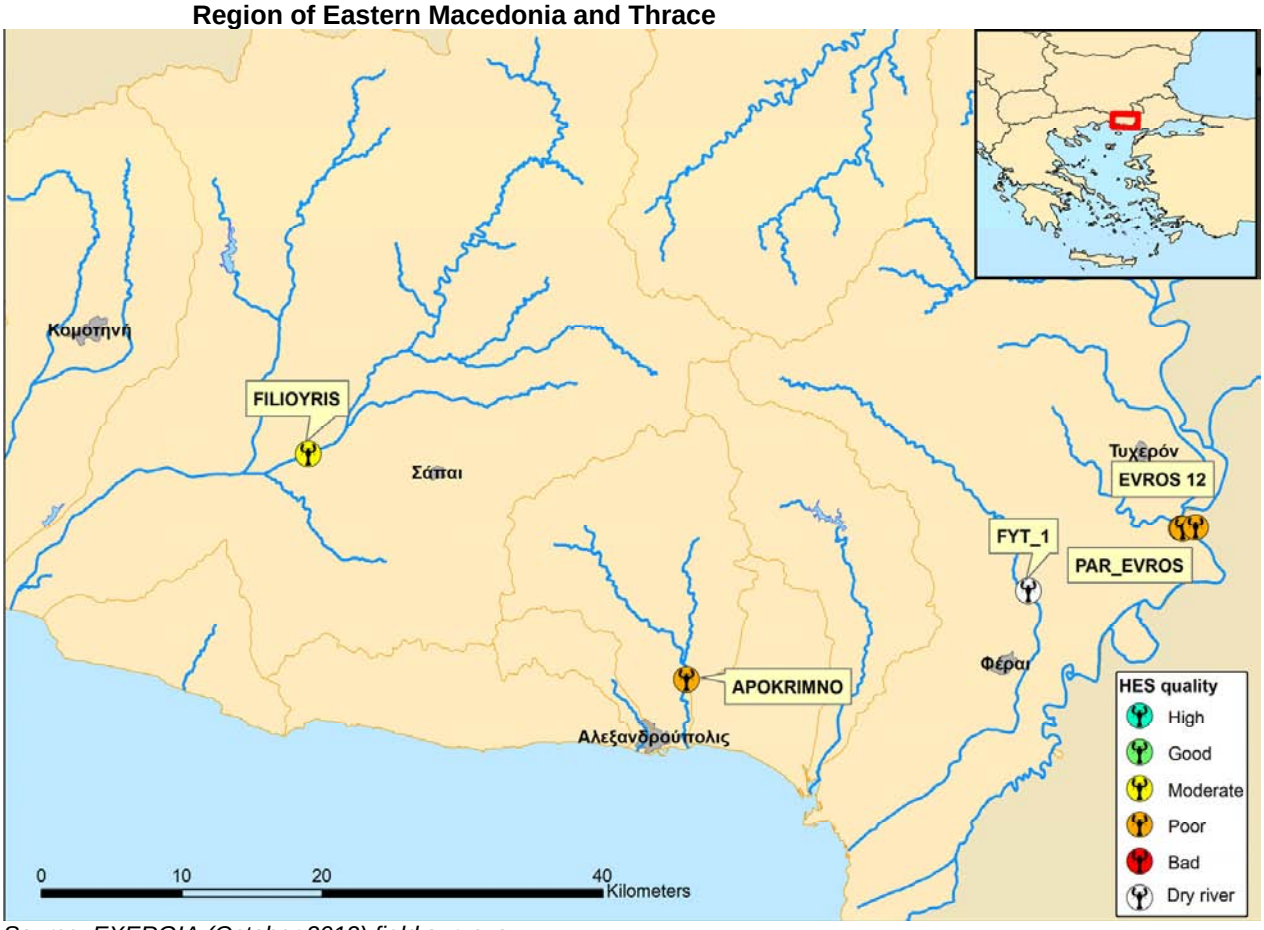
According to HES index, based on species richness and their adaptability to perturbations the water quality varied from moderate to poor (*Table 6-92*). The biological samples of benthic macroinvertebrates, that reflect the past situation of a river over a period of several months (Calow & Petts,1992), showed that Filiouris, Kosinthos and Gallikos have a moderate quality whereas Apokrimno, Provatonas, Chionorema and Evros had a poor quality. In addition, all Aliakmonas crossing points (including Vrachopotamos) and Axios ranged from moderate to good water quality with regards to macroinvertebrate populations. All crossings at lowland rivers and streams including Grammatiko ranged from bad to moderate quality.

Table 6-92 Microinvertebrate index (HES) for water quality at the crossing points of the TAP pipeline

Site (crossing point)	*Status according to the macroinvertebrate water quality index (HES)*
Evros	Poor
Provatonas	Poor
Fyetemata	No data
Apokrimno (Erini)	Poor
Filiouris	Moderate
Chionorema	Poor
Aspropotamos	No data
Xiropotamos (Kompsatos)	No data
Kosinthos	Moderate
Nestos	No data
Tafros Aggiti	Poor
Aggitis	Moderate
Krousovitis	Poor
Strymonas	Poor
Gallikos	Moderate
Axios	Good
Vardarovasi	Bad
Loudias	Poor
Canal 66	Poor
Grammatiko	Moderate
Koilada stream	Poor
Kastoria (Gioli) canal	Poor
Aliakmonas I	Moderate
Aliakmonas II	Moderate
Aliakmonas III (Vrachopotamos)	Good

Source: EXERGIA (July 2011, October 2012) and ASPROFOS (Summer 2012, Spring 2013) field surveys

Figure 6-82 Freshwater Macroinvertebrate Water Quality Index Results in the east part of the Region of Eastern Macedonia and Thrace



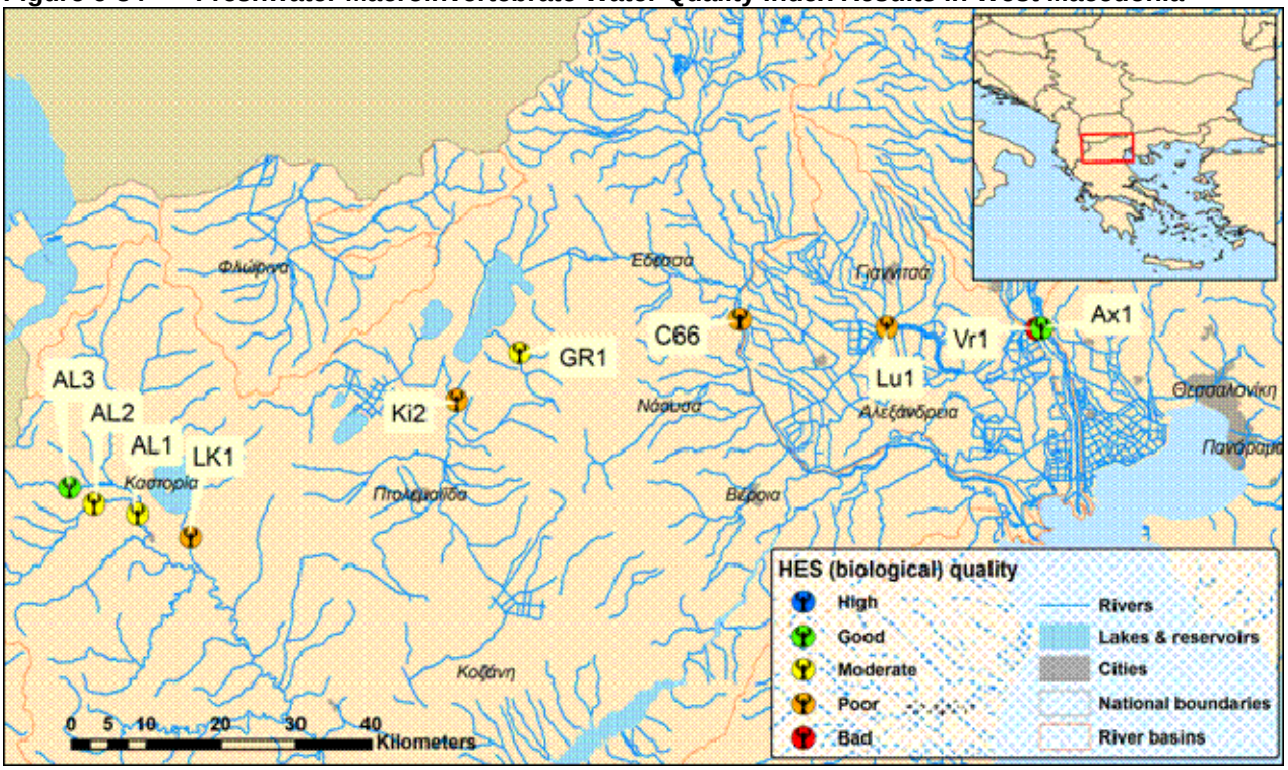
Source: EXERGIA (October 2012) field surveys

Figure 6-83 Freshwater Macroinvertebrate Water Quality Index Results in the west part of the Region of Eastern Macedonia and Thrace and in the Region of Central Macedonia



Source: ASPROFOS (Summer 2012, Spring 2013) field surveys

Figure 6-84 Freshwater Macroinvertebrate Water Quality Index Results in West Macedonia



Source: ERM field surveys (July 2011)

6.3.3.5.2 Ichthyofauna

Fish are used as indicators of aquatic quality based on the principle of the *Index of Biotic Integrity* (IBI) which promotes the fact that fish communities respond to human alterations of aquatic ecosystems in a predictable and quantifiable manner. An IBI is a tool to quantify human pressures by analysing alterations of the structure of fish communities. The original IBI (Karr 1981) uses several components of fish communities, e.g. taxonomic composition, trophic levels, abundance and fish health. Each component is quantified by metrics (e.g. proportion of intolerant species). In the European Union there is an attempt to create a common “European Fish Index” and initial steps toward this have produced the EFI. The European Fish Index (EFI) is based on a predictive model that derives reference conditions for individual sites and quantifies the deviation between predicted and observed conditions of the fish fauna.

Applying the fish index is important since fish are Biological Quality Elements based on the WFD. In this application of an index of biotic integrity a simple preliminary index was applied based on fish attributes (or metrics) that are known to be responsive to environmental degradation. The fish

metrics include the following fish-based attributes; they are categorized as positive (increasing gradient) or negative (decreasing gradient) relative to anthropogenic pressures on the site:

- Species richness (positive; generally higher in reference conditions)
- Native species richness (positive; generally higher in reference conditions)
- Native Abundance (positive; generally higher in reference conditions)
- Number Introduced (negative; generally low/non-existent in reference conditions)
- Percent Introduced (negative; generally low/non-existent in reference conditions)
- Native Reproduction (positive; generally larger number in reference conditions)
- Number Size Classes (positive; generally larger number in reference conditions)

The five-point scale is as the WFD scale:

- High (value 5): Biotic attributes of the fish community at reference condition levels
- Good (value 4): Biotic attributes of the fish community minimally apart from reference
- Medium (value 3): Biotic attributes of the fish community significantly impacted by anthropogenic pressures but some natural aspects present.
- Poor (value 2): Biotic attributes of the fish community significantly impacted and significant distance exists from natural conditions.
- Bad (value 1): All biotic attributes of fish community impacted by human pressures.

In the East Section, 28 species were recorded, comprising 24 native and 4 alien fish species. The following major taxonomic families dominated: Cyprinidae, Cobitidae, and Gobiidae. The fish species composition within the crossing points varied from 17 species to one species. The Evrosand Apokrimno sites appeared to be impacted by water pollution which seems to influence the structure of the fish community. At Gallikos, Strymonas, Kosinthos, Aspropotamos, Xiropotamos and Apokrimno there is evidence of intensive upstream water abstraction during summer, an event that among other considerations may hinder movement of migratory fish and destroy connectivity between different parts of the river; this is considered as the main possible reason that eels were nowhere observed within the project area despite resident farmers reporting that eel existed at Apokrimno about a decade ago.*Table 6-93* summarizes the findings

of ichtyofauna along the pipeline route and *Table 6-95* the water quality according to indexes based on Water Framework Directive compliant metrics.

In the West Section[35], approximately 2,877 fish specimens were collected during the sampling in the sites of the study area. These comprised 17 native and non-native fish species within the following major taxonomic families: Cyprinidae, Cobitidae, Nemacheilidae, Poeciliidae, Percidae, and Gobiidae. This represents about 60% of all native primary freshwater species recorded within the four river basin areas[36] (total of about 28 species, excluding eel and other euryhaline marine species) (Economou et al., 2007). Only 3 non-native species were observed and are confirmed as alien to the water basin areas (Carassius gibelio, Gambusia holbrooki, Pseudorasbora parva), although one of the so-called native species is recently suspected as being a translocated species (*Oxynoemacheilus bureschi*). The fish species composition within the different rivers crossing points varied from 11 species to no fish species at all. Three of the sites that were severely impacted by pollution and/or other anthropogenic pressures had 1 or no fish species present (see *Table 6-94*). In the smaller upland river stretches electrofishing sampling collected[37] nearly all fish species present in the inspected river reach under inspection. In the four lowland reaches, a large proportion of the present fish species that were present were collected. However not all were collected due to difficult conditions in sampling with the particular equipment available. Table 6-94 summarizes the findings of ichthyofuana along the pipeline route and *Table 6-95* the water quality according to indexes based on the EU Water Framework Directive compliant metrics.

Table 6-93 Semi-quantitative Abundance of freshwater fish (East Section)

Species	***RED DATA BOOK Greece***	***Sites (crossing points)***													
		Evros	***Fytemata***	***Apokrimno***	***Filiouris***	***Chionorema***	***Aspropotamos***	***Xiropotamos (Kompsatos)***	***Kosinthos***	***Nestos***	***TafrosFilippon***	***Aggitis***	***Krousovitis***	***Strymonas***	***Gallikos***
Alburnus alburnus	LC	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Alburnus vistonicus [E]	CR	0	0	0	2	0	0	0	1	0	0	0	0	0	0
Alburnus cf. thessalicus [E]	LC	0	0	0	0	0	0	0	0	0	2	0	0	0	0

[35] Through additional route refinement undertaken since the main field survey activites were conducted in June / July 2011, the Loudias River is now not directly crossed by the pipeline route. However, the Loudias River field results have been kept in the baseline as the sampling area is in proximity to the new crossing points of Loudias tributaries and are therefore to some extent relevant.
[36] Aliakmonas, Axios, Loudias and Vegorittis.
[37] No species loss was incurred.

Species	***RED DATA BOOK Greece***	***Sites (crossing points)***													
		Evros	***Fytemata***	***Apokrimno***	***Filiouris***	***Chionorema***	***Aspropotamos***	***Xiropotamos (Kompsatos)***	***Kosinthos***	***Nestos***	***TafrosFilippon***	***Aggitis***	***Krousovitis***	***Strymonas***	***Gallikos***
Alburnoides strymonicus [E]	LC	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Barbus balcanicus [E]	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Barbus cyclolepis[E]	LC	1	0	3	3	0	3	3	3	0	0	0	0	0	0
Barbus strumicae[E]	LC	0	0	0	0	0	0	0	0	0	1	3	0	0	0
*Carassius gibelio**	LC	3	0	1	0	0	0	0	0	0	0	0	0	0	0
Chondrostoma vardarense [E]	LC	3	0	0	0	0	0	0	0	0	0	2	0	0	0
Cobitis punctilineata[E]	VU	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cobitis vardarensis [E]	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Cobitis strumicae[E]	LC	2	0	3	3	0	3	3	3	0	0	0	0	0	0
Cyprinus carpio	VU	1	0	0	0	0	0	0	0	0	0	0	0	0	0
*Gambusia holbrooki**		1	0	0	0	0	0	0	0	0	1	0	0	0	3
Gobio bulgaricus [E]	LC	0	0	0	2	0	0	3	3	0	0	0	0	0	2
Knipowitschia caucasica	LC	1	0	0	0	0	0	0	0	0	0	0	0	1	0
*Lepomis gibbosus**		1	0	1	0	0	0	0	0	0	3	0	0	0	0
Oxynoemacheilus bureschi	LC	0	0	0	0	0	0	3	1	0	0	1	0	0	0
Perca fluviatilis	LC	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleuciscus borysthenicus	LC	0	0	0	0	0	0	0	0	0	2	0	0	0	0
*Pseudorasbora parva**		2	0	0	0	0	0	0	0	0	0	0	0	0	2
Proterorhinus semilunaris	LC	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodeus amarus	LC	2	0	0	3	0	0	2	0	0	3	0	0	0	0
Rutilus rutilus	LC	3	0	0	0	0	0	0	0	0	3	0	0	0	0
Silurus glanis	LC	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Squalius orpheus [E]	LC	3	0	3	3	1	3	3	3	1	0	0	0	0	0
Squalius vardarensis [E]	LC	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Vimba melanops [E]	VU	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Number of Species		17	0	5	6	1	3	6	6	1	9	5	1	1	6

Comments:
Abundance is given in a semi-quantitative scale of 3 points:
1= Scarce; single individuals (less than 10 individuals), one size-class per 100 m. Longitudinal river stretch.
2= Common/ Large numbers (more than 10 individuals), more than one size class per 100 m. Longitudinal river stretch.
3= Abundant (more than 20 individuals) and more than two size classes per 100 m. Longitudinal river stretch.

-Fish species that are introduced or translocated by humans in the systems are given with asterisk.
-Endemics to the Southern Balkans are shown by the letter E, all endemics are considered to be taxa of conservation interest. The rest are widespread (European, world distribution)

LC: Least Concern
VU: Vulnerable
CR: Critically endangered

Source: EXERGIA (October 2012) and ASPROFOS (Summer 2012) field surveys

Table 6-94 Semi-quantitative Abundance of Fish (West Section)

Species	RED DATA BOOK Greece	Sites (in East-West direction)									
		Ax1	Vr1	Lu1	C66	GR1	Ki2	LK1	AL1	AL2	AL3
Anguilla anguilla (note 1)	CR/NT	*x*		*x*					*x*	*x*	*x*
Alburnoides bipunctatus	LC/LC	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*3*	*3*
Alburnus thessalicus E	LC/LC	*3*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*
Alosa fallax(note 1)	LC/DD/*	*x*		*x*					*x*	*x*	*x*
Barbatula barbatula(note 1)	LC/LC	*x*							*x*	*x*	*x*
Barbus balcanicus E	LC/LC/*	*2*	*0*	*0*	*1*	*0*	*0*	*1*	*3*	*3*	*3*
Barbus macedonicus E	DD/LC/*	*1*	*0*	*0*	*(1)*	*0*	*0*	*0*	*1*	*2*	*0*
*Carassius gibelio**		*0*	*1*	*1*	*(1)*	*0*	*0*	*0*	*0*	*0*	*0*
Chondrostoma vardarense E	NT/LC	*3*	*0*	*0*	*(1)*	*0*	*0*	*0*	*1*	*2*	*0*
Cobitis vardarensis E	LC/LC/*	*0*	*0*	*1*	*3*	*0*	*0*	*0*	*0*	*0*	*0*
Esox Lucius (note 1)	LC/LC/	*x*		*x*					*x*	*x*	*x*
Eudontomyzon hellenicus(note 1)	CR/CR/*								*x*	*x*	*x*
*Gambusia holbrooki**		*0*	*3*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Gasterosteus gymnourus(note 1)	LC/LC/	*x*		*x*					*x*	*x*	*x*
Gobio bulgaricus E	LC/LC/	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*2*	*0*	*2*
Knipowitschia caucasica		*3*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Oxynoemacheilus bureschi?*	LC/LC/	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Pachychilon macedonicum E	LC/LC/	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Perca fluviatilis	LC/LC/	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Phoxinus cf. phoxinus(note 1)	LC/LC/	*x*		*x*					*x*	*x*	*x*
Pungitius platygaster(note 1)	LC/VU	*x*		*x*					*x*	*x*	*x*
*Pseudorasbora parva**		*2*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Rhodeus meridionalis E	LC/LC/*	*3*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Romanogobio elimeius E	LC/DD/*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*0*
Rutilus rutilus	LC/LC/	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Sabanejewia balcanica E	LC/LC/*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Salaria fluviatilis(note 1)	LC/LC	*x*		*x*					*x*	*x*	*x*
Salmo pelagonicus(note 1)	VU/VU/*	*x*							*x*	*x*	*x*
Scardinius erythrophthalmus(note 1)	LC/LC/	*x*		*x*					*x*	*x*	*x*
Silurus glanis(note 1)	LC/LC/	*x*		*x*					*x*	*x*	*x*
Squalius vardarensis E	LC/LC/	*2*	*0*	*1*	*3*	*0*	*0*	*0*	*1*	*3*	*3*
Tinca tinca(note 1)	LC/DD/	*x*		*x*					*x*	*x*	*x*
Vimba melanops E	DD/VU/	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Zingel balcanicus(note 1)	DD/DD/*	*x*									
Native Abundance Mean		*2.4*	*1.7*	*1.8*	*1.5*	*0*	*0*	*1.0*	*1.4*	*2.3*	*2.8*
Total Number of Species		*11*	*3*	*10*	*8*	*0*	*0*	*1*	*7*	*6*	*4*

Abundance (semi-quantitative scale):
x = Expected species from literature sources. Not sampled during the field surveys and consequently no abundance

Species	RED DATA BOOK Greece	Sites (in East-West direction)									
		Ax1	Vr1	Lu1	C66	GR1	Ki2	LK1	AL1	AL2	AL3

data can be presented.
1= Scarce; single individuals (less than 10 individuals), one size-class per 100 m. Longitudinal river stretch.
2= Common/ Large numbers (more than 10 individuals), more than one size class per 100 m. Longitudinal river stretch.
3= Abundant (more than 20 individuals) and more than two size classes per 100 m. Longitudinal river stretch.

-Fish species that have been introduced or translocated to the watercourse systems are identified with an asterisk.
-Endemics to the Southern Balkans are shown by the letter E.Table 6.3.3 14 Literature data on native freshwater fish fauna of the four catchment areas (After Economou et al. 2007)
Note 1: Literature data on native fish fauna in the four catchment areas, adopted by Economou et al. (2007)

Ax1	*Axios*	*Ki2*	*Koilada / Kastro stream*
Vr1	*Vardarovasi*	*LK1*	*Kastoria (Gioli) canal*
Lu1	*Loudias*	*AL1*	*Aliakmon I*
C66	*Canal 66*	*AL2*	*Aliakmon II*
GR1	*Grammatiko*	*AL3*	*Aliakmon III (Vrachopotamos)*

Source: ERM field surveys (July 2011)

Table 6-95 Fish Index Results

	Richness	Native Richness	Native Abundance	Alien abundance	Number Introduced	Percent Introduced	Native Reproduction	Number Size Classes	Migratory Fish	Sum of metric values	Mean of values	Preliminary Index of Biotic Integrity	European Fish Index
Evros	3	3	3		2	2	3	2	3	18	2.625	Moderate	N/A
Fytemata	0	0	0		0	0	0	0	0	0	0	Bad	N/A
Apokrino (Erene)	3	2	4		2	2	3	4	0	20	2.5	Moderate	N/A
Filiouris	4	4	4		5	5	4	3	0	29	3.625	Good	N/A
Chionorema	2	2	2	4			2		0	12	2	Poor	N/A
Aspropotamos	3	2	3	5			2		0	15	2.5	Moderate	N/A
Xiropotamos (Kompsatos)	3	3	3	5			2		0	16	2.67	Moderate	N/A
Kosinthos	3	3	4	5			4		2	21	3.5	Good	N/A
Nestos										0	0	N/A	N/A
Tafros Filippon	5	4	4	2			2		2	23	3.125	Good	N/A
Aggitis	3	4	4	5			5		2	31	3.875	Good	N/A
Krousovitis											0	N/A	N/A
Strymonas											0	N/A	N/A
Gallikos	3	3	3	2			3		2	16	2.67	Moderate	N/A
Axios	5	5	5		2	3	5	5		30	4.3	Good	N/A
Vardarovasi	3	1	1		2	1	1	1		10	1.4	Bad	Poor
Loudias	5	5	4		3	3	5	4		29	4.1	Good	N/A
Canal 66	5	4	3		5	5	4	4		30	4.3	Good	N/A
Grammatiko	1	1	1		1	1	1	1		7	1.0	Bad	Bad
Koilada / Kastro stream	1	1	1		1	1	1	1		7	1.0	Bad	Bad
Kastoria (Gioli) canal	1	1	1		-	-	1	1		5	1.0	Bad	Good
Aliakmon I	5	5	4		5	5	5	3		32	4.6	High	Good

	Richness	*Native Richness*	*Native Abundance*	*Alien abundance*	*Number Introduced*	*Percent Introduced*	*Native Reproduction*	*Number Size Classes*	*Migratory Fish*	*Sum of metric values*	*Mean of values*	*Preliminary Index of Biotic Integrity*	*European Fish Index*
Aliakmon II	5	5	5		5	5	5	4		34	4.9	High	High
Aliakmon III (Vrachopotamos)	4	4	5		5	5	5	4		32	4.6	High	Good

Notes:
The principle of the Index of Biotic Integrity (IBI), promotes the fact that fish communities respond to human alterations of aquatic ecosystems in a predictable and quantifiable manner. An IBI is a tool to quantify human pressures by analysing alterations of the structure of fish communities. In the European Union there is an attempt to create a common "European Fish Index" and initial steps toward this have provided the EFI. The European Fish Index (EFI) is based on a predictive model that derives reference conditions for individual sites and quantifies the deviation between predicted and observed conditions of the fish fauna.

Source: EXERGIA (October 2012) and ASPROFOS (Summer 2012) field surveys, ERM (2011)

Based on the Preliminary Index of Biotic Integrity, out of the 24 rivers investigated, most of them are of good (7) aquatic quality. Three (3) river are of high quality, five (5) are of moderate, three (3) of poor and five (5) of bad aquatic quality. For three (3) rivers this index could not be evaluated due to lack of validated data.

6.3.3.5.3 Riparian Forest Quality Index

The riparian quality was assessed with the Riparian Forest Quality Index (QBR)[38]. QBR index was developed initially for Mediterranean streams in order to provide a rapid and standardized assessment of riparian habitat quality using easily identified and measurable riparian vegetation elements and selected stream condition features. The QBR index is visually assessed on-site. The index relies on four metrics of riparian habitat quality which include: (i) total riparian cover, (ii) cover structure, (iii) cover quality, and (iv) channel alterations[39]. After completing a standardized two-sided field-form, the sum of the four metrics gives the final QBR index. The four metric scores range from 0 (bad quality) to 25 (high) and the QBR total score from 0 (bad quality) to 100 (high).

Regarding the East Section, sites have very poor riparian cover due to embankments, channelization and general agricultural disturbance in the riparian zone. Cover structure is also rather poor. Cover quality is also extremely low with the exception of Nestos and Erini stream (Aprokimno). Regarding the West Section, the riparian woodland condition, according to QBR, was in a better state in the upland rivers (Aliakmon, Grammatiko), whereas the artificial rivers,

[38] Munné et al., 2003
[39] Chatzinikolaou et al., 2011

canals and lowland rivers had a degraded riparian forest mainly due to the lack of riparian cover, i.e. the latitudinal limitation of the riparian zone.

Table 6-96 Riparian Forest Quality (QBR) Index Results

Site	*Riparian Cover*	*Cover Structure*	*Cover Quality*	*Channel Alteration*	*Final QBR Score*
Evros	0	0	15	10	25
Provatonas	0	0	0	10	10
Fytemata	Highly modified site, no discharge				
Apokrimno (Erene)	0	5	25	25	55
Filiouris	0	10	5	10	25
Chionorema	0	10	0	5	15
Aspropotamos	0	5	10	5	20
Xiropotamos (Kompsatos)	0	10	0	10	20
Kosinthos	0	10	0	10	20
Nestos	0	25	25	25	75
Tafros Aggiti	0	0	15	0	15
Aggitis	0	15	10	10	35
Tafros Belitsa	0	10	5	0	15
Strymonas	0	15	20	10	45
Gallikos	0	10	0	25	35
Axios	0	10	20	10	40
Vardarovasi	0	20	5	0	25
Loudias	0	10	5	0	15
Grammatiko	20	15	25	25	85
Koilada/ Kastro stream	0	20	10	0	30
Canal 66	0	10	0	0	10
Kastoria (Gioli) canal	0	5	5	10	20
Aliakmon I	0	15	25	25	65
Aliakmon II	15	15	25	25	80
Aliakmon III (Vrachopotamos)	15	25	25	25	90

Note: Riparian habitats in natural condition≥ 95; Slight disturbance: 75-90; Moderate disturbance: 55-70; Strong habitat alteration: 30-50; Extreme degradation: ≤ 25
Source: EXERGIA field survey data (October 2012), ERM (July 2011)

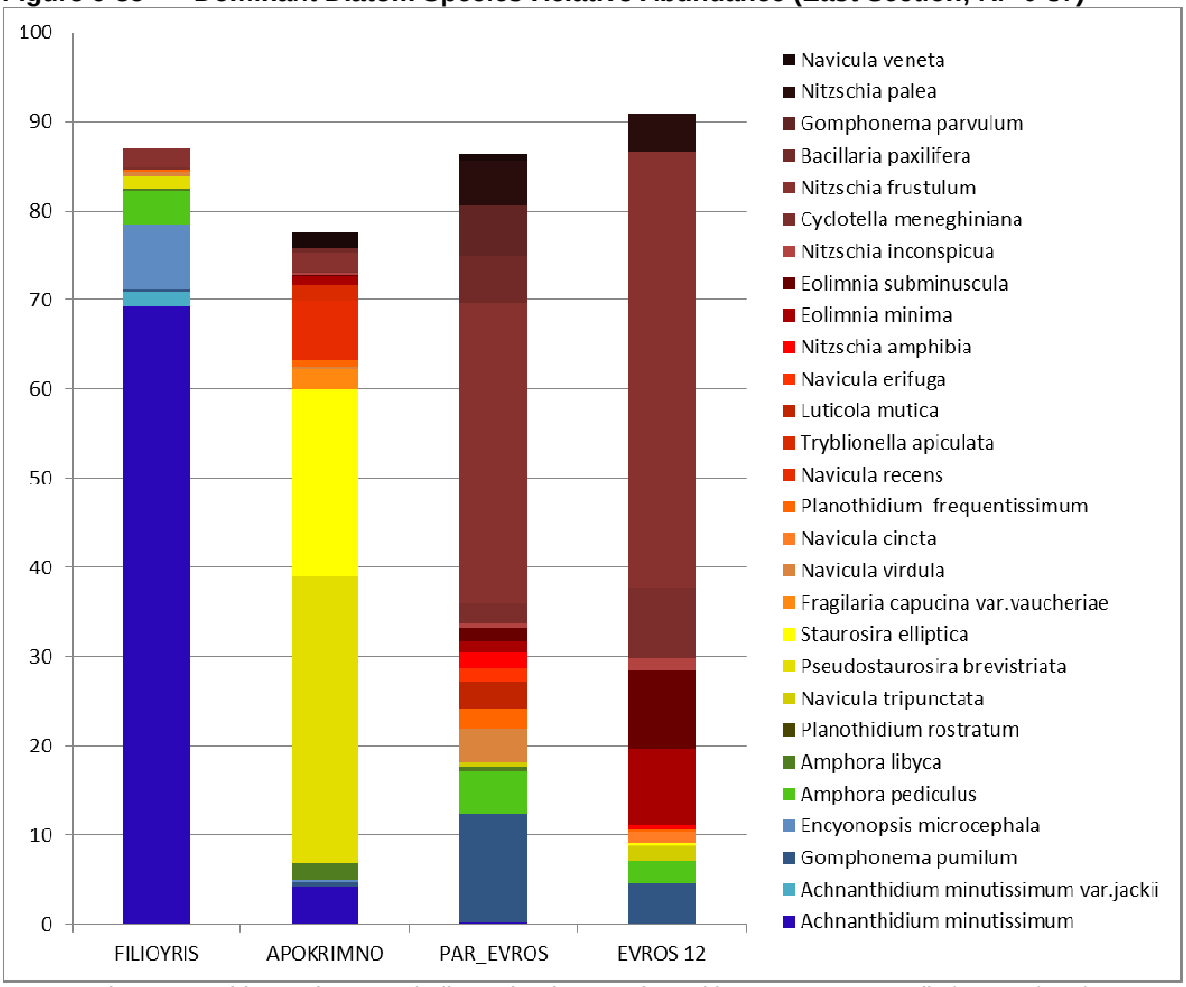
6.3.3.5.4 Diatoms

Diatoms have been used since the turn of the century to assess river water quality (Lange-Bertalot 1978, 1979a, 1979b, Whitton et al. 1991). Most water quality indices are based on a score given to each species in relation to different classes of chemical water quality (CEMAGREF, 1982). This score, an indicator value of each taxon, is obtained from the information from existing databases in different regions. Thus, for each species its range and ecological amplitude is known. To assign a specific score, then this approach takes into account the most important physical and chemical parameters causing relevant perturbations in aquatic systems (such as temperature, pH, conductivity, dissolved oxygen, BOD, COD, total nitrogen, ammonia, nitrites, nitrates, phosphates and chlorides). With these data, each species is assigned a probability of being in a particular ecological range. This information is categorized for each taxon to obtain a sensitivity factor to pollution, which is modulated with an indicator value of their ecological amplitude. For example species with a narrow ecological amplitude (i.e. stenotopic)- are considered as a good indicator, whereas species with a wide range of ecological tolerance (i.e. eurytopic) are valued as a poor indicator. The *Indice de Polluosensibilité* – IPS (Cemagref, 1982) is one of the widely used indices in Europe at present. It integrates the effects of all pollutants, including organic pollution, salinity, toxins etc.

In the East Section, a total of 123 diatom taxa have been found in this study. Out of these 59 diatom taxa reached the relative abundance of more than 1% in minimum at one sample and 28 taxa have a significant presence with a relative abundance over 5% at minimum of one site. These taxa are those that mostly define the composition of communities and largely determine the values of the indices of water quality. Finally, five species are present in all samples, while 56 species are present in only one site.

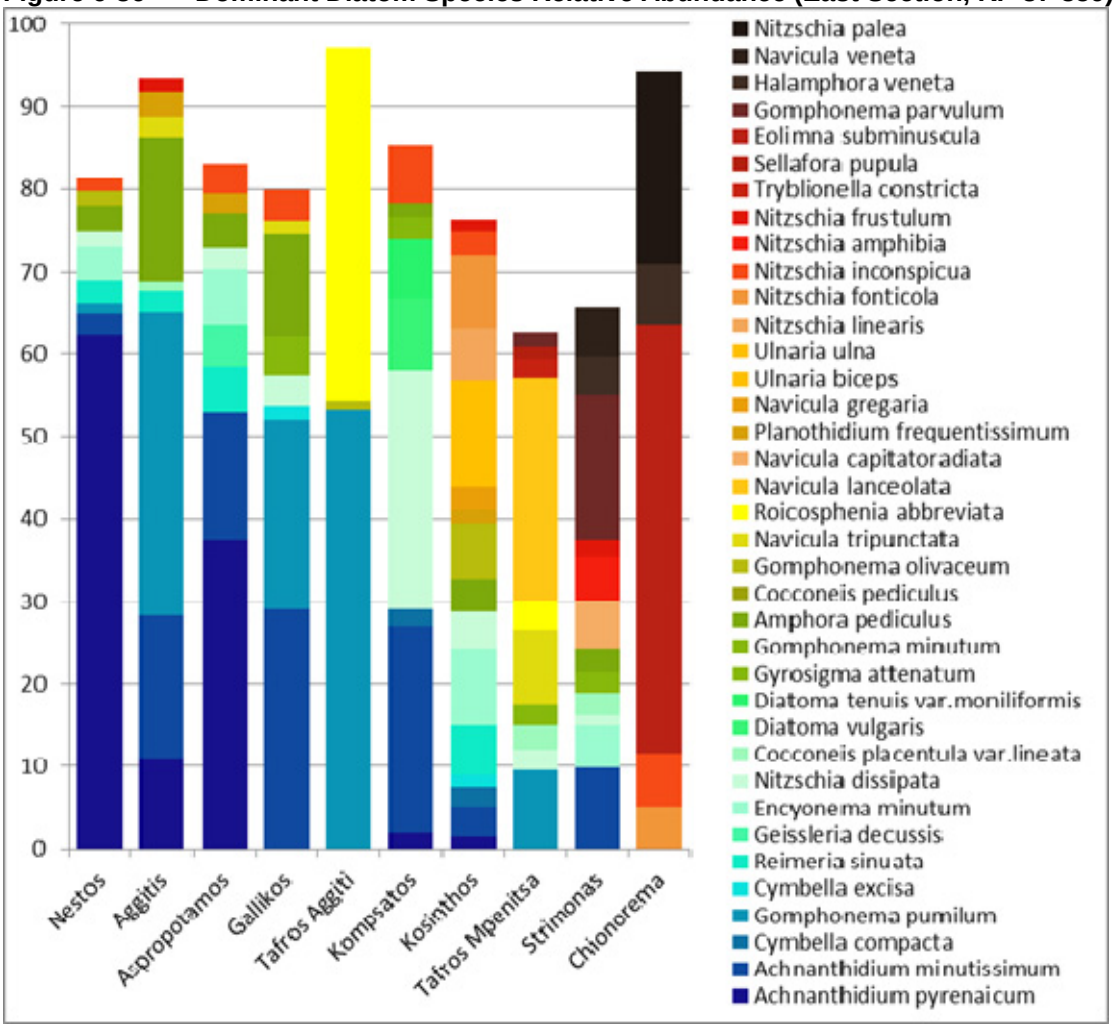
In the West section, a total of 95 taxa of benthic diatoms have been identified. Only 16 of them are present in more than half of the localities, whilst the majority of them (44 species), are present only in one site. Diatom communities are therefore very different across the watercourses surveyed. The species richness per site ranges from 12 at AL1, which is the site where less species have been identified, to 44 species recorded at the Ax1 site.

Figure 6-85 Dominant Diatom Species Relative Abundance (East Section; KP 0-87)



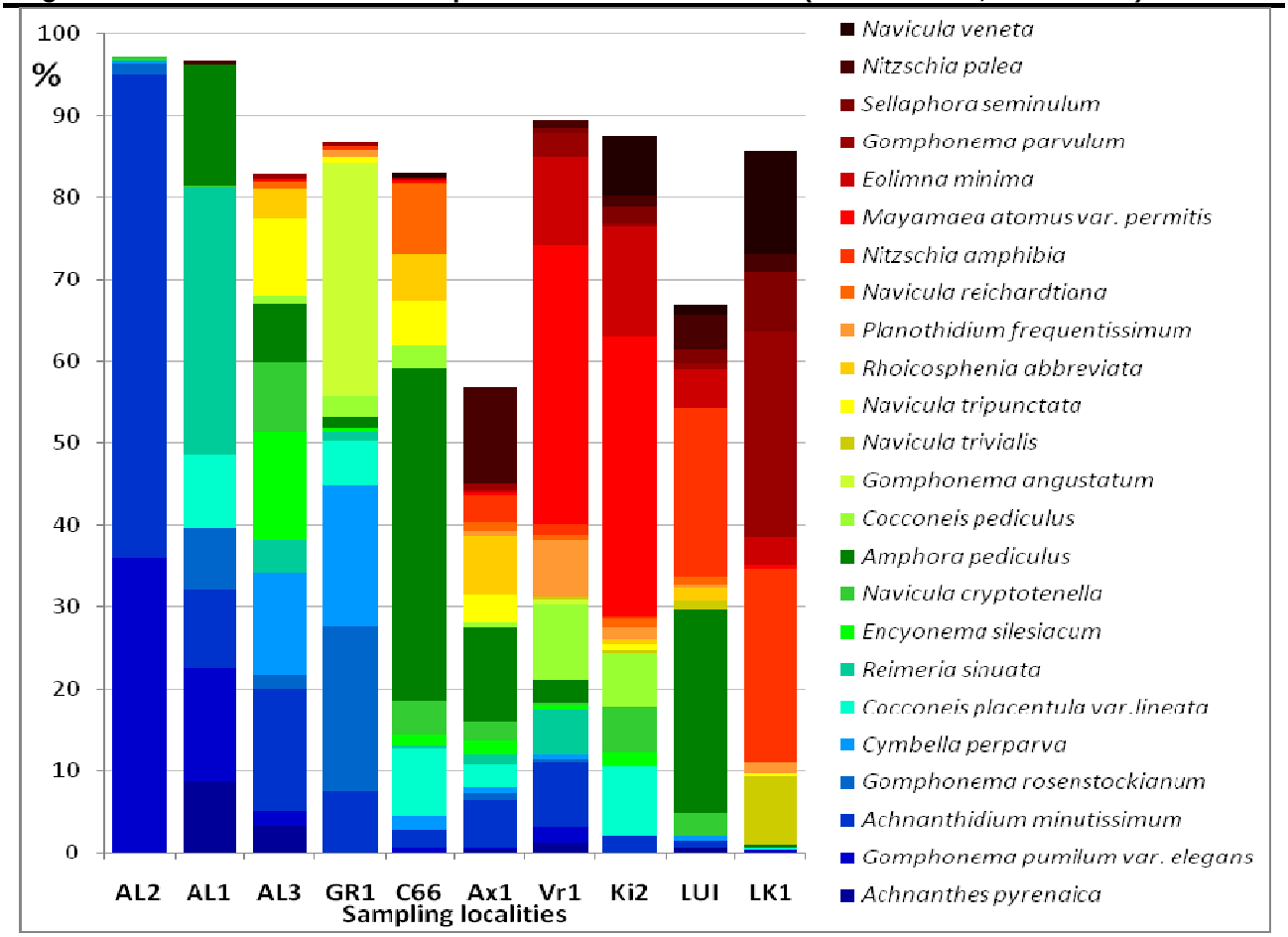
Notes: Colours are arbitrary chosen to indicate the degree of sensitiveness to water pollution. Red and orange colours indicate species very tolerant to pollution, whereas blue and green hues are for species living in unperturbated waters.
Source: EXERGIA field survey (October 2012)

Figure 6-86 Dominant Diatom Species Relative Abundance (East Section, KP 87-359)



Notes: Colours are arbitrarily chosen to indicate the degree of sensitiveness to water pollution. Red and orange colours indicate species very tolerant to pollution, whereas blue and green hues are for species living in unperturbated waters
Source: NCC field survey (April 2013)

Figure 6-87 Dominant Diatom Species Relative Abundance (West Section; KP 359-543)



Notes: Colours are arbitrarily chosen to indicate the degree of sensitiveness to water pollution. Red and orange colours indicate species very tolerant to pollution, whereas blue and green hues are for species living in unperturbated waters.

Ax1	*Axios*	*Vr1*	*Vardarovasi*	
Lu1	*Loudias*	*C66*	*Canal 66*	
GR1	*Grammatiko*	*Ki2*	*Koilada /*	*Kastro stream*
LK1	*Kastoria (Gioli) canal*	*AL1*	*Aliakmon I*	
AL2	*Aliakmon II*	*AL3*	*Aliakmon III (Vrachopotamos)*	

Source: ERM (2011)

The EU Water Directive considers that a river has an acceptable biological quality concerning diatoms when an IPS index based on diatom communities is higher than 13. Such diatoms communities were recorded at Filiouris, Aspropotamos, Kompsatos, Kosinthos, Nestos, Tafros Aggitis, Aggitis, Kroussovitis and Gallikos in the East Section, and the three Aliakmonas crossings, Grammatiko and Canal 66 in the West Section. In the West Section, eleven (11) locations surveyed do not meet this threshold: Evros, Provatonas, Aprokimno, Chionorrema, Strymonas, Axios, Vardarovasi, Kilada, Loudias and Gioli canal. The full field survey report is provided in *Annex 6.5.8.*

Results of the IPS index of water quality based on the diatoms communities are present in *Table 6-97.*

Table 6-97 IPS Index Results

Site	*IPS*	*Quality*
Filiouris	18.0	High
Apokrimno (Erene)	12.2	Moderate
Provatonas	7.8	Poor
Evros	7.1	Poor
Chionorrema (Bosbos)	3.9	Bad
Aspropotamos	17.0	High
Xiropotamos (Kompsatos)	15.9	Good
Kosinthos	14.1	Good
Nestos	17.8	High
Tafros Aggitis	16.6	Good
Aggitis	17.4	High
Tafros Mpelitsa (Krossouvitis)	13.8	Good
Strymonas	10.2	Moderate
Gallikos	16.6	Good
Axios	11.2	Moderate
Vardarovasi	10.9	Moderate
Loudias	8.2	Poor
Canal 66	15.8	Good
Grammatiko	16.5	Good
Kilada	9.2	Moderate
Gioli	5.2	Poor
Aliakmonas I	18.5	High
Aliakmonas II	19.8	High
Aliakmonas III (Vrachopotamo)	18.3	High

Source:ERM, EXERGIA and NCCfield survey (2011-2013)

6.3.3.5.5 River Evros Section

The crossing point with River Evros is an ichthyofaunal-rich site (17 species collected at one sampling location on the EvrosRiver, immediately downstream of the Provatonas channel confluence). Fish populations were very dense with limited size-class variation showing a predominance of small-sized specimens (or single size-classes for some abundant species). Shoreline habitats (where there was a low marshy fringe) were dominated by stagnophilous

species predominantly *Carassius gibelio and Rutilus rutilus. Rhodeus amarus* populations are perhaps limited and its abundance is lower than expected. Adjacent fast-flowing habitats with coarse substrates were dominated mostly with species of the genus *Chondrostoma, Squalius, Alburnus, Proterorhinus* and very few *Vimba*. Deeper water species and larger fish included only small number of *Chondrostoma vardarense* and *Squaliusorpheus* and one *Cyprinus carpio.* It must be noted, however, that the sampling methodology did not allow reaching deeper waters. The presence of alien species is relatively high, highlighted here by the predominance of *Carassius gibelio*, the frequent occurrence of *Pseudorasbora parva* and the single occurrence of *Lepomis gibosus*. Species from the river are expected to enter the Provatonas channel and the confluence of both rivers may be considered a hot-spot for fishes where many species may congregate to forage and spawn.

The preliminary freshwater fish index for river Evros shows that the aquatic communities are impacted by the relative super-abundance of one non-indigenous species (NIS),*Carassius gibelio*. The presence of three NIS in total; and the low numbers of detected migratory fish together with the rather restricted size-classes (age-classes) collected indicate a relatively impacted fish community. Concerning migratory fish (many of them being large-bodied in this river), *Chondrostoma, Barbus, Vimba* and *Alburnus* are all considered important potamodromous species. Eels were not collected but local fishermen confirm their presence. Although a large number of species reproduce in this reach, some species had very low numbers of juveniles and the rare species *Vimba melanops* was unusually scarce. Several species that would be expected to hold more abundant populations at this site were caught in rather low numbers (i.e. *Perca fluviatilis*) or in lower numbers than expected (i.e. *Cobitis strumicae, Barbus cyclolepis, Silurus glanis, Rhodeus amarus, Gobio bulgaricus*). Some larger predatory species were not caught at all (e.g. *Aspius aspius*) or were collected in very small numbers (e.g. *Silurus glanis*). The site is assessed as “Moderate” using the preliminary fish index.

6.3.3.5.6 Southern Evros Section

The crossing point at “Fytemata” is impacted by artificial desiccation as surface waters are abstracted for agriculture. Downstream longitudinal connectivity is known to be further disturbed, preventing migratory fish movements. The site is assessed as “bad” using the preliminary fish index; all metrics are down to nil indicative of the current degraded condition.

The crossing point at “Apokrimno” stream is characteristic of mid-lowland fish fauna of a relatively small catchment at low elevation (28m) with the presence of marshy-fringe habitats (reedbed with *Phragmites* and *Typha*). In general, it is expected to be a relatively ichthyofauna-rich site although only 5 species were collected within the reach. Fish populations were, however, quite dense here, probably due to the drying-out taking place upstream and downstream of the sampling point forcing fish to stay with the remaining wet areas. The stagnophilous *Cobitis strumicae* was abundant. Other stagnophilic species would be expected within the biogeographical characteristics of the catchment though none was recorded during the sampling. A local farmer informed that eels existed at this site about a decade ago but they were not collected during sampling. Alien species presence is relatively low, only *Lepomis gibossus* and *Carassius gibelio* are present, and in very low densities. The “Apokrimno” site is assessed as “moderate” using the preliminary fish index; the only metrics which indicate low ecological integrity include numbers of species introduced and the percentage of species introduced, the absence of migratory species and the absence of other stagnophilousor low elevation small-river fish species (e.g. *Gobio, Rhodeus, Salaria, Anguilla* were expected, but were not present). The ichthyological metrics that are applied show that the site is close to the moderate-good boundary. However the analysis of macrobenthic communities reveals a poor community with relatively low presence of species tolerant to degradation.

6.3.3.5.7 Lowlands of Evros Section

River Filiouris is an ichthyofauna-rich site (6 species collected). Fish populations were at rather high densities and exhibiting a natural-looking spread of size-classes and community characteristics. Larger size-classes were not collected but they were observed slightly upstream of the site (i.e. very large *Squalius* specimens were observed). Amateur fishermen frequent the site in the summer season and it is probable that human predation force the remaining large-bodied fish to disperse or to find cover in deeper pools upstream. Downstream desiccation may, however, impact large-bodied individuals (i.e. populations may be trapped in pools and suffer severe declines). Shoreline habitats were dominated by *Rhodeus meridionalis* and *Cobitis vardarensis*, otherwise the site is rich in *Squalius* and *Gobio* with large numbers of *Barbus* in the riffle sections primarily. This is complemented by good populations of the *Alburnus vistonicus*, a species that had never been collected before in the FiliourisRiver. *Alburnus vistonicus* is assessed as Critical in the recent Red Data Book of Threatened Animals in Greece so the

discovery of the population in the mid-section of the Filiouris is of significant conservational value. This species is a strongly migratory fish, usually moving upstream to spawn in pebble-gravel-cobble substrates in rivers with moderate flow; fish move downstream often in lowland reaches or lake-like bodies outside the spawning period.

The site is assessed as “good” using the preliminary fish index, despite the low results on “native species abundance”. However a few more species were expected in this lowland river ecosystem (*Petroleuciscus, Salaria, Rutilus* for example). Migratory species such as the catadromous Eel (*Anguilla anguilla*) was also expected as thehabitat was optimal for this species but was not collected–. The fact that *Alburnus vistonicus* was recorded here at relatively good abundance implies that the Filiouris crossing point is of strong conservational interest.

6.3.3.5.8 Komotini – Xanthi Plain Section

Five different points were sampled within the Komotini-Xanthi plain area; the Chionorrema stream and the Aspropotamos, Kompsatos (or Xiropotamos), Kosinthos and Nestos Rivers.

On the Chionorrema stream (also known as Bosbos) only the rather tolerant *Squalius Orpheus* species was recorded, confirming the poor condition of the stream in terms of ichtyological community.

The Aspropotamos stream crossing corresponds to a shallow water site where three freshwater fish species were collected. The fish community is characterised by very few tolerant species with a suppressed occurrence of *Barbus cyclole.* The site is assessed as “moderate” using the preliminary fish index despite the limited community present and mainly due to the absence of alien species. The riparian gallery at the crossing site is heavily degraded.

The crossing site of Xiropotamos stream (or Kompsatos) is strongly impacted by gravel-mining upstream and water abstraction (surface water diversion for agricultural use) and the riparian gallery is virtually non-existent. Six fish species were collected but not the critically endangered *Alburnus vistonicus* which was expected to be present there. The fish community that was found includes a high densities but with low richness values. The site is assessed as “moderate” by the preliminary fish index.

The Kosinthos stream crossing point presents signs of being impacted by upstream water abstraction and by organic pollution. Six species were collected including the migratory rheophilous and critically endangered *Alburnus vistonicus* although at very low numbers and no alien species were recorded. Barriers to longitudinal fish movement might hinder dispersal of all migratory taxa at this site.Thefish index result classifies it as of “good” water quality.

At Nestos crossing point, due to sampling difficulties in terms of access to the site only one species was recorded from the shore, the rather tolerant*Squalius Orpheus*. This is probably due to the sampling conditions with high waters and rapid flow probably as a result of a fast-flowing hydro-peak event caused by operations at the dam upstream. As a result the water quality freshwater fish index could not be obtained for this crossing point. However it is expected, according to recent surveys[40] and studies that this site hosts a rich fish community with at least 12 species.

6.3.3.5.9 Filippoi Plain Section

The Filippi ditch or Taffros Aggitis crossing site hosts a rich fish community with 9 species recorded during the survey. Fish populations were very dense with limited size-class variation showing a predominance of small-sized specimens in the inshore parts of the channel. Since the channel was steeply sloping the diversity of habitat types was high, but dominated by lentic habitat type and with shoreline habitats rich in plants and diverse. These aquatic habitats were dominated by stagnophilous fish species of predominantly *Rhodeus amarus, Lepomis gibbosus, Petroleuciscus borysthenicus and Rutilus rutilus.* The predatory fish, *Esox lucius* was collected as well, showing that the food web is especially rich at this area. The rare endemic *Cobitis puctilineata* was also recorded. Non-indigenous species (NIS) presence is relatively high, highlighted here by the population predominance of *Lepomis gibbosus*, and the rather isolated occurrence of *Gambusia holbrooki.* The site is assessed as “good” by the preliminary fish index.

The crossing site of River Aggitis is characterized by a fast-flowing and rather cool water environment. Five species were collected within the reach in very dense numbers. The site can be considered as a lowland cyprinid medium-sized river community but the area does hold marsh habitats and backwaters with silty pools where stagnophilous species are known to exist, at least

[40]Economou & al (2007)

downstream of the crossing site. However, no stagnophilous, rare or range-restricted species were collected. The fish index result classifies it as of “good” water quality.

6.3.3.5.10 Serres Plain Section

KroussovitisRiver (or Tafros Mpelitsa) crossing point is a channelized small stream that has a variety of restricted in-stream habitats and a very degraded riparian zone. At the pipe-line crossing site there are many trees and branches in the river creating a fair variety of habitats. Otherwise the artificial banks are steep and the riparian zone is very degraded. Fish populations exist within the site as has been documented a few kilometres upstream, but this specific point could not be sampled due to difficult local conditions. Only three fish specimens were observed from the embankment including the rather tolerant*Squalius orpheus*, a typical species in channelized streams with runs and pools dominating.

River crossing point is on a wide almost meandering part of the Strymonas with a narrow floodplain banked by high embankments. At the pipe-line crossing site there is a rather wide riparian woodland area; many trees are in a flooded bank area with some trees having fallen into the river creating a variety of habitats within the flooded riparian zone. However fish sampling could not be performed due to high flows during the visit. The site is expected to be an ichthyofaunally-rich site. Fish populations exist within the site as has been documented a few kilometers downstream and upstream (former sampling found ten species and a fish preliminary index classified as “moderate” water quality). Only one small benthic species could be identified, a goby of the species *Knipowitschia caucasica* was found.

6.3.3.5.11 Gallikos Plain Section

Six fish species were collected from the river crossing point site in the lower-mid section of the Gallikos river (*Gobio bulgaricus, Squalius vardarensis, Gambusia holbrooki, Cobitis vardarensis, Barbus balcanicus, Pseudorasbora parba*). Many barriers to fish longitudinal movement exist and influence migratory rheophilous fish species which are expected to have difficulties reaching at the site. The result is a fish community dominated by non-indigenous species with a suppressed

occurrence of the species that should dominate in this type of site (i.e. *Barbus* and *Squalius).* The fish index result classifies it as of “moderate” water quality.

6.3.3.5.12 Axios Plain Section

Three different crossing points along the route were sampled within the Axios Plain section Axios River, Vardarovasi River and Canal 66 watercourse. An additional sampling point was Loudias River, close to the three tributary canals that will be crossed by the pipeline.

11 species of fish were collected at two sampling points on the Axios River. Fish populations found were very dense with varied size-classes and healthy numbers of large specimens. The aquatic habitat along the channel edge were dominated by Rhodeus meridionalisand fast-flowing sectionsmostly with *Chondrostoma*, *Vimba*, *Alburnoides* and *Alburnus*. Deeper water species and larger fish include *Barbus macedonicus*, *Chondrostoma vardarense* and *Squalius vardarense*. Non-native species presence is relatively low, only *Pseudorasbora parva*. Electrofishing was not possible exactly at the crossing point location but took place immediately upstream below the Eleousa Dam. The site is assessed as “good” using the preliminary fish index. Elements of the metrics which are low include only numbers of species introduced and percentage of species introduced. However, the site is immediately below a dam that may fragment the fish populations (this is not evident through application of the specific metrics in this index).

The sampling effort indicated an ichthyofauna-poor site on the Vardarovasi River, since only 3 species were collected. Fish populations were very sparse and only non-native species were present (*Gambusia holbrooki, Pseudorasbora parva, Carassius gibelio*). The site is assessed as “bad” using the preliminary fish index. Nearly all metrics are low, and the dominance of rather low densities of non-native fish is indicative of a very degraded condition. However, access to the site was limited and the area sampled was restricted.

Although Canal 66 is an ichthyofauna diverse site (6 species collected; and another 3 species caught by local amateur fishermen 500 m downstream), fish populations were sparse and exhibited low-density attributes. Large- bodied individuals and larger size-classes are absent or rare. The situation is unusual and may be due to seasonal pollution (population crashes during summer when the water body is severely polluted by fruit-juice factory discharges and other

sources of agro-pollution). The bank habitats are dominated by *Rhodeus meridionalis* and *Cobitis vardarensis*. The site is assessed as "good" using the preliminary fish index; the only metric which is rather low is "native abundance". However the site is rather difficult to sample; and in fact its community was obviously impoverished for this specific type of lowland river ecosystem. Although the site is a modified artificial canal today, we do not have knowledge of its past conditions, but suspect a much more fish-rich site (richer in fish population density, species-richness, size-classes, more species reproducing etc).

Finally, In Kilada River no fish was recorded apparently extirpated due to pollution. Based on the local resident interviews it is correct that the site be assessed as "bad" by the preliminary fish index since fish are known to have inhabited the site in the past.

6.3.3.5.13 Vermio Mountain Slopes Section

The pipeline route crosses the Grammatiko Stream (GR1). No fish were recorded. Cover and conditions are suitable for fish species and anecdotal evidence suggests that fishes (mostly *Rutilus sp* or other cyprinids) where abundant 30 years ago. It is understood that after water abstraction projects for agricultural exploitation, most parts of the stream water dried-out during summer and the fish were extirpated (this happened in the early 1990's). This stream used to be permanently connected to Lake Vegoritis but now this connection is artificially intermittent. Crayfish also allegedly used to inhabit the stream and are also said to be extirpated. Based on the local interviews it is correct that the site be assessed as "bad" by the preliminary fish index.

6.3.3.5.14 Ptolemaida Basin Section

The pipeline route crosses the Kilada Stream (Ki2). No fish were recorded. It was a very polluted site; fish populations are apparently extirpated due to pollution. Based on the local resident interviews it is correct that the quality of the site is assessed as "bad" by the preliminary fish index, since fish are known to have inhabited the site in the past.

6.3.3.5.15 Askion Mountain Slopes Section

No crossing points in this area.

6.3.3.5.16 Kastoria-to-Border Section

Four different points were sampled within the Kastoria-to-border area; the Gioli canal, two locations on the Aliakmonas River and a final location on the Vrachopotamos River (a tributary to the Aliakmonas River).

In the Gioli canal only one individual species was collected (*Barbus balcanicus*). This is a very polluted site and fish populations nearly completely extirpated due to pollution. Local farmers report that the site was rich in eels in the late 1960s. Also until recently *Barbus, Squalius, Esox, Chondrostoma* and *Tinca* were allegedly present. After the canal had been polluted by an alleged malfunctioning sewage treatment plant, fish have been extirpated. Based on the local interviews and the preliminary fish index this site is assessed as “bad”.

Regarding the first sampling point on the Aliakmonas River (KP 521.2), 7 species of ichthyofauna were collected. Fish populations were sparse, but the site was difficult to be sampled due to many deeper sections (“run” hydromorphological habitats). Shallower waters were dominated by *Barbus balcanicus, Gobio bulgaricus, Alburnoides bipunctatus,* and *Squalius vardarensis*. Only a rheophilic species assemblage was present. The site was very difficult to be sampled in a standardized procedure (and sampling was further hampered by rainfall). Despite this, the attributes of those samples taken provided enough elements to show that the site was of “high” status according to the preliminary fish index. This assessment should be treated with caution since the site was not adequately sampled with respect to reach, extent and area.

Regarding the second sampling point on the Aliakmonas River (KP 528), 6 species of ichthyofauna were collected. Fish populations were dense but the site was difficult to be sampled due to many deep sections (run habitats). Shallower waters were dominated by Barbus balcanicus, Alburnoides bipunctatus, Squalius vardarensis and with a fairly important high population presence of Chondrostoma vardarense. Only a rheophilic species assemblage was present. The site was very difficult to sample in a standardized procedure, but a stretch of about

380 m was covered during the sampling, giving an adequate impression of shallower reaches of the channel braids. Despite the difficulty in sampling such a site the attributes of those samples taken provide enough elements to show that the site is of “high” status according to the preliminary fish index. In fact this site has the highest index rank of all the sites sampled.

Finally, the sampling in Vrachopotamos indicated an ichthyofauna-poor site, since only 4 species were collected (no non-native species were present). Fish populations were rich, while conditions were found very good for reproduction. The water dominated by *Barbus balcanicus, Squalius vardarensis, Alburnoides bipunctatus*, and with a fairly important presence of *Gobio bulgaricus*. The site is assessed as “high” using the preliminary fish index.

6.3.3.5.17 Summary of Aquatic Ecology

The tables below show the results of the water quality analysis of the field survey data, regarding the rivers crossed by the pipeline, in a sequence from *East* to *West*. For additional information please refer to *Annex 6.5.7*.

Table 6-98 Summary of Water Quality Indices

River	*Preliminary Freshwater fish Index of Biotic Integrity*	*European Fish Index*	*Riparian Forest Quality Index*	*Macroinvertebrate (HES) index*	*Diatom index IPS*	*Comments - Conclusions*
Evros	**Moderate**	**N/A**	**Bad**	**Poor**	**Poor**	The aquatic communities are impacted primarily by the relative super-abundance of one NIS[41]; the presence of three NIS in total and the lack of migratory fish and the rather restricted size-classes (age-classes) collected. Although a large number of species reproduced in this reach some species had very low numbers of YOY and the rare species *Vimba melanops* was very scarce at the site. Several species that should perhaps have been more abundant were caught in low numbers (i.e. *Perca fluviatilis*). Some larger predatory species where not caught at all (*Aspius aspius*) or in very small numbers (*Silurus glanis*).Generally this site is extremely difficult to sample effectively and the results may be confounded by sampling inadequacies; a strong sampling effort was nevertheless made at the site in October 2012 (so the level of confidence is rather high).
Provatonas	**N/A**	**N/A**	**Bad**	**Poor**	**Poor**	Electrofishing was not executed exactly at the crossing point location, because the water was too little and it was not flowing, but took place immediately downstream of the channel of Provatonas. Species from the Evros River obviously should enter the Provatonas channel and the river-mouth confluence may be considered a fish habitat hot-spot where many species may occasionally congregate to forage and spawn.
Fytemata	**Bad**	**N/A**	**N/A**	**N/A**	**N/A**	No fish present in reach and this is due to artificial desiccation (altering flow regime).
Apokrimno (Erene)	**Moderate**	**N/A**	**Moderate**	**Poor**	**Moderate**	The freshwater fish populations are impacted but references are difficult to ascertain. NISare present in low numbers, migratory fish are absent and some stagnophilous species that are expected are also absent. Despite this situation, the metrics show that the site is close to the moderate-good boundary.
Filiouris	**Good**	**N/A**	**Bad**	**Moderate**	**High**	The site is rather difficult to sample; and in fact its fish community reference attributes are poorly known. A few more species were expected in this lowland river ecosystem (*Petroleuciscus, Salaria, Rutilus* for example). Migratory species such as the catadromous *Anguilla anguilla* is also expected but was not collected. Habitat was optimal for A. anguilla. The total absence of alien species being present increased the assessment rating rising it to near the good-high boundary. The presence of *Alburnus vistonicus* a critically endangered taxon according to IUCN and the Red Data Book Greece is of strong conservation interest.

[41] Non-Indigenous Species (NIS), see section 3

River	*Preliminary Freshwater fish Index of Biotic Integrity*	*European Fish Index*	*Riparian Forest Quality Index*	*Macroinvertebrate (HES) index*	*Diatom index IPS*	*Comments - Conclusions*
Chionorrema	**Poor**	**N/A**	**Bad**	**Poor**	**Bad**	The river is impacted heavily by water pollution near the city of Komotini. There is not enough ichthyological information to further assess site conditions or integrity. Former HCMR research downstream of the site has documented a degraded fish community; pollution and surface water abstraction being key problems.
Aspropotamos	**Moderate**	**N/A**	**Bad**	**N/A**	**High**	Conditions are hydrologically rather degraded. The water level of the site is probably anthropogenically impacted. The riparian gallery is heavily disturbed with riparian vegetation extensively degraded. Instead of a fairly rich fish fauna mostly amphibians are common. The result is a fish community dominated by very few tolerant species. Size and age-classes of all fish are restricted to young stages only.
Xiropotamos (Kompsatos)	**Moderate**	**N/A**	**Bad**	**N/A**	**Good**	The site is intensively anthropogenically impacted due to gravel-mining upstream and significant water abstraction. The riparian gallery is heavily disturbed with riparian vegetation extensively degraded. Barriers to fish. A fish community with high population densities but missing several species; and with its most threatened species in very low numbers
Kosinthos	**Good**	**N/A**	**Bad**	**Moderate**	**Good**	The water level of the site is probably anthropogenically impacted and lowered; the riparian gallery is heavily disturbed with riparian vegetation extensively degraded. Barriers to fish. Migratory rheophilous fish species are found in very low numbers at the site. A fish community with high population densities but missing several species; and with its most threatened species in very low numbers.
Nestos	**N/A**	**N/A**	**Good**	**N/A**	**High**	The site was visited during a high-water fast-flowing hydro-peaking event in late July and could not be sampled safely. The water temperature was remarkably low. Data from HCMR's research in the recent past shows that it is a fairly rich environment for fishes.
Tafros Aggitis	**Good**	**N/A**	**Bad**	**Poor**	**Good**	Fish populations were very dense with limited size-class variation showing a predominance of small-sized specimens in the inshore parts of the channel. Shoreline habitats are rich in plants and diverse, but riparian degraded.
Aggitis	**Good**	**N/A**	**Poor**	**Moderate**	**High**	It is expected to be a relatively ichthyofaunal-rich site but the waters are fast flowing and colder for some low-land species. The position where the pipe-line crossing is located has an unusual feature of being flooded by the impoundment created by the road-crossing. Fish populations were very high and dense. Riparian conditions had many natural features but disturbed.

River	*Preliminary Freshwater fish Index of Biotic Integrity*	*European Fish Index*	*Riparian Forest Quality Index*	*Macroinvertebrate (HES) index*	*Diatom index IPS*	*Comments - Conclusions*
Tafros Belitsa	**N/A**	**N/A**	**Bad**	**Poor**	**Good**	The water body is on a channelized small stream that has a variety of restricted in-stream habitats and a very degraded riparian zone. At the pipe-line crossing site there are many trees and branches in the river creating a fair variety of habitats. Otherwise the artificial banks are steep and the riparian zone very degraded. This would probably be a site poor in fish species-richness and heavily modified by total channelization.
Strymonas	**N/A**		**Poor**	**Poor**	**Moderate**	The water body is on a wide almost meandering part of the Strymon with a narrow floodplain banked by high embankments. At the pipe-line crossing site there is a rather wide riparian woodland area; many trees are in a flooded bank area; some trees have fallen into the river creating a variety of habitats within the flooded riparian zone. Riparian conditions had many natural features but disturbed.
Gallikos	**Moderate**	**N/A**	**Poor**	**Moderate**	**Good**	The water level of the site is probably anthropogenically impacted; the riparian gallery is heavily disturbed with riparian vegetation extensively degraded; many barriers influence migratory rheophilous fish. The fish community is dominated by non-indigenous species with a suppressed occurrence of the species that should dominate in this site.
Axios	**Good**	**N/A**	**Poor**	**Good**	**Moderate**	The freshwater fish and the macroinvertebrate indices show that the aquatic communities at Axios crossing point are in very good state and several protected species thrive there. The riparian vegetation is however severely degraded.
Vardarovasi	**Bad**	**Poor**	**Bad**	**Bad**	**Moderate**	There is a consensus of all indices in the status of Vardarovasi stream: its current state indicates strong deterioration of several ecological attributes
Loudias	**Good**	**N/A**	**Good**	**Poor**	**Good**	The riparian vegetation is well-conserved and the freshwater fish populations comprise several protected species, however mass fish kills have been reported at this point in the past.
Grammatiko	**Bad**	**Bad**	**Bad**	**Moderate**	**Good**	The fact that no discharge is observed during the summer months due to abstracting water for irrigation is the one single factor that brings down almost all indices of ecological status in the particular location.
Koilada/ Kastro stream	**Bad**	**Bad**	**Bad**	**Poor**	**Moderate**	There is a consensus of all indices in the status of Kilada stream: its current state indicates strong deterioration of several ecological attributes

River	*Preliminary Freshwater fish Index of Biotic Integrity*	*European Fish Index*	*Riparian Forest Quality Index*	*Macroinvertebrate (HES) index*	*Diatom index IPS*	*Comments - Conclusions*
Canal 66	**Bad**	**Good**	**Bad**	**Poor**	**Poor**	There are contradictory results on the status of the Gioli canal: the stream is channelized and severely degraded. In addition, in cases of disfunctioning of the sewage treatment facility upstream it allegedly carries heavy pollutant load. There are reports that in the past the stream had rich freshwater fish populations
Kastoria (Gioli) canal	**High**	**Good**	**Moderate**	**Moderate**	**High**	There is a consensus of all indices in the status of all three Aliakmonas crossings: moderate to excellent state
Aliakmon I	**High**	**High**	**Good**	**Moderate**	**High**	Moderate to excellent state
Aliakmon II	**High**	**Good**	**Good**	**Good**	**High**	Moderate to excellent state

N/A: not applicable

Source: EXERGIA (October 2012) and ASPROFOS (Summer 2012) field surveys, ERM (2011)

6.3.4 Protected Areas / Sites of Conservation Interest

6.3.4.1 Protected Areas

Table 6-99 lists the protected areas (Natura 2000 sites, protected areas under the Forest Law, National Parks, Wildlife Refuges and Ramsar sites) within the Project region (Habitat and Protected Area maps along the pipeline route are provided in *Annex 4.1* of this ESIA).An overview of the protected areas located close to the pipeline route is presented below.

It is highlighted, that according to the relevant legislation (see *Section 3* and *Annex 2*), a project is allowed to cross through the boundaries of a protected area, as long as it is of national importance and that alternatives have been assessed as not cost effective in both environmental and economic aspects.

Table 6-99 Protected Areas within the Project Study Area

No.	*Site*	*Natura 2000 code*	*Forest Law/ Environmental Law*	*Other major Environmental Protection Schemes*	*Size of Protected Area (max, approx) (ha)*	*Approx. Distance of Site boundary to pipeline route (km)*	*Crossings by the Route*
East Section (From KP 0 to KP 359)							
1	National Park of Evros	SPA GR1110006 SAC GR1110007 Ramsar Site	JMD 4110/2007	Wildlife refuge of Evros Delta (GG674/B/1991)	20,000	3.1	No
2	National Park of Dadia – Lefkimi – Soufli Forest	SPA GR1110002 SAC GR1110005	JMD 911/13-10-2006	Wildlife refuge of Zoglia-Kalyvia-Dadia-Lefkimi (GG 612/12-01-1981)	42,800	3.5	No
3	Notio Dasiko Symplegma Evrou	SPA GR1110009		Wildlife refuge Kavissos – Pilaia (GG 342/B/1997)* Free-range wildlife farm Kirki (GG 1325/15 May 1996)	29,275		Yes
4	Wildlife Refuge Kavisos – Pilaia		GG 342 /B/1997	Partially within SPA GR 1110009	650	0.2	No
5	Filiouris river	SCI GR11300006			34,357		Yes
6	Wildlife Refuge Hatisio	-	GG 601/B/30-04-1976		1,350		Yes
7	National Park East Macedonia – Thrace	SAC GR1150010, SPA GR1150001, SAC GR1130009 SPA GR1130010* and the corresponding Ramsar sites	GG 497/D/17-10-2008	Wildlife refuge Kotza Orman (GG 342/B/1997) Wildlife refuge Kompsatos (GG 342/B/1997)	93,000		The route crosses the National Park and within its boundaries 3 Natura 2000 sites (GR1150010, GR1150001 and GR1130009), the two mentioned wildlife refuges and the Ramsar Site of Vistonis Lake
8	Wildlife Refuge AgiosTimotheos - Kioupia	-	GG 733/B/76		2,430		Yes
9	Aesthetic Forest of Kavala - Amygdaleona		GG 606/D/1979		2,637	2.3	No

10	Wildlife Refuge Petroto		GG 754/27-08-1996	1,080		Yes
11	Wildlife Refuge Louggas – Kavatzikia-Ntermentersi (Krinidos – Fyllidos)	-	GG 405/09-07-1981	781	1.8	No
12	Wildlife Refuge Chimarros Gazorou – Palaia Zichni		GG 759/09-08-1977	920	1.3	No
13	Wildlife Refuge Profiti Ilia		GG 625/19-07-1978	936	1.02	No
14	Wildlife Refuge Ntamaria – Kosta Vrisi		GG 676/01-06-2001	1012.5	1.9	No
15	Wildlife Refuge Dimitritsio		GG 4819/14-06-1999	2,500	0.14	No
16	National Park Koronia - Volvi	SPA GR1220009 *	GG 248/D/05.03.2004	16,388		The route crosses the peripheral zone of the National Park but not the Natura 2000 site
West Section (From KP 359 to KP 543)						
1	Delta Axiou – Loudia – Aliakmona - Evryteri Periochi – Axioupoli (Estuaire of Axios-Loudias-Aliakmonas Rivers – Broader Area – Axioupoli)	SAC GR1220002		29,647		Yes
2	Delta Axiou – Loudia – Aliakmona – Alyki Kitrous (Estuaire of Axios – Loudias – Aliakmonas Rivers – Saltmarsh of Kitrous	SPA GR1220010		33,676		Yes
3	Kastoria lake (Orestiada	SCI GR1320001		4,732	0.5	No
4	Chimaditida and Zazari lakes	SCI GR1340005, SPA GR1340008		5,193	1.8	No
5	Vegoritis – Petron lakes	SCI GR1340004 SPA GR1340007		12,569	0.4	No

6	Axios – Aliakmonas – Loudias delta – Aliki Kitrous and surrounding area[3]	SCI GR1220002 SPA GR1220010	Ramsar site (GG 350/T.A./20-11-1974, GG 84/A/31-5-91) National Park GG ΑΠΠ220/ 14 May 2009	33,682 SCI area	1.4km to Ramsar sire and National Park	The route crosses the Natura 2000 site but lies outside the border of the National Park and Ramsar site
7	Vermio Mountain	SCI GR1210001		255,555	2.0	No

*NOTES: *: The site is not crossed by the pipeline. [1]: Grammos mixed forest, [2]: declared as "National Woodland park", [3]: Including river Axios, [4]: Designated landscape areas*

Source: Compiled by ASPROFOS (2013), Ministry of Environment (2011)

Appropriate Assessments have been conducted for all Natura 2000 sites crossed by the pipeline and provide elaborate information regarding the qualifying features of the protected sites. These Appropriate Assessments can be found in:

- Annex 8.7 for SPA GR11100009–Notio Dasiko Symplegma Evrou (South Evros Forest Complex),
- Annex 8.8 for SAC GR1130006 – Potamos Filiouris (Filiouris River),
- Annex 8.9 for SAC GR 1130009 - Limnes kai Limnothallasses tis Thrakis (Lakes and Lagoons of Thrace),
- Annex 8.10 for SPA GR1150001 and SAC GR1150010 – Delta Nestou kai Limnothalasses Keramotis (Nestos' Delta and Lagoons of Keramoti), and
- Annex 8.11 for SAC GR1220002 – Delta Axiou – Loudia – Aliakmona - Evryteri Periochi – Axioupoli (Estuaire of Axios-Loudias-Aliakmonas Rivers – Broader Area – Axioupoli) and SPA GR1220010 – Delta Axiou – Loudia – Aliakmona – Alyki Kitrous (Estuaire of Axios – Loudias – Aliakmonas Rivers – Saltmarsh of Kitrous)

6.3.4.1.1 Forest Complex of South Evros

Forest complex of South Evros is a Natura 2000 site (SPA GR1110009). The proposed pipeline crosses through the middle of the first area of the Notio Dasiko Symplegma Evrou for about 15 km, from KP 21.5 to KP 34, and from KP 49.7 to KP 51, approximately (see *Annex 4*).In this area, the project follows the existing DESFA pipeline. The site is a forest complex at the south-eastern end of the RodopiMountain. It is characterized by low hills covered with *Quercus, Caprinus, Fraxinus* and *Acer* woodland and scrub. *Fagus* forest dominates the northern area; *Pinus* forest and plantations occur in the south. This is an important site for breeding and wintering raptors and other resident species associated with forests. Breeding birds include some of the species that are restricted in Europe to the Mediterranean biome (when breeding). Species of concern include: *Haliaeetus albicilla, Neophron percnopterus, Aegypius monachus, Circaetus gallicus, Buteo rufinus, Aquila pomarina, Aquila clanga, Aquila heliaca, Aquila chrysaetos, Hieraaetus pennatus, Falco naumanni, Bubo bubo, Hippolais olivetorum, Lanius nubicus*.The main threats include illegal use of poisoned baits for raptors, afforestation with plantations, forest grazing and increasingly intensive forest management.

More details are provided in the Appropriate Assessment, in *Annex 8.7.*

6.3.4.1.2 Filiouris River

This is a Natura habitat in Rodopi Regional Entity (SAC GR1130006 – Potamos Filiouris). In this area, the project follows the existing DESFA pipeline (see *Annex 4*). The proposed corridor crosses a small segment of the southern part of the Natura 2000 area – the FiliourisRiver (approximately 400 m). The area, which is adjacent to Vouna Evrou, is a steep-sided valley, with rocky sides and slopes that descend from the Demir Tsal (Sarka) hills. It consists of oak forests and pastures. The new name of the area Potamos-Koilada Filiouri (*Filiours River Valley)* is LissosRiver, which is a very long river, composed of many streams. It is now threatened by an inappropriate reforestation with Pines in open Oak forest, by road construction and by development in general. Nevertheless, abundant relics of riparian forest exist along the river as well as scattered inside the different agricultural cultivations. The site is rich in birds of prey including Neophron percnopterus, *Gyps fulvus, Circactus, Aquila pomarina, A. chrysaetos* and possibly *Hieraaetus pennatus*. Moreover it is the most important feeding area for vultures. Additional breeding species include *Ciconia nigra, Dendrocopos medius* and *Hippolais olivetorum*. The river provides freshwater to the near-to-sea wetlands. The reference on *Leuciscus cephalus* is about the subspecies macedonicus.

The river was banked up with dykes on both sides especially on its plain part. The rapidly extending agricultural exploitation through land reclamation schemes has caused the loss of large areas of former natural habitats in the wetland. Thus, most of the freshwater marshes and reedbeds were drained along the river and riparian forests were cut. The destruction of wetland habitats with the richness and diversity described, have also had a very serious impact on the raptor fauna and fish of the bordering mountainous areas. Establishment of an industrial zone between Thrilorion and Aratos villages along the Komotini-Alexandroupolis road at a distance of 1-2 km away from the river is expected to lead to pollution by industrial waste, in the near future. Fertilizers and waste have altered the water quality towards eutrophication and affected the ecological character of the river. There are also roads, bridges as well as railway tracks inside the site.

More details are provided in the Appropriate Assessment, in *Annex 8.8.*

6.3.4.1.3 National Park of Eastern Macedonia – Thrace

National Park of Easter Macedonia – Thrace was established in 2008 (HGG 497/D/17.10.2008) as well as its Management Body. It covers an overall area of approximately 93000 ha. The objective of the national park, and its management body, is the protection of the habitats and the flora and fauna species biodiversity. It is divided into four (4) sub-sections (zones) of different levels of protection: Zone A (*Nature protection area)*, Zone B (*Protected natural formation, protected landscape features)* and Zone C (*Area of ecodevelopment*) and Zone D (*Peripheral zone)*. In general, Class A projects are not allowed to cross through boundaries of the National Park. Exceptions exist for projects of national importance. TAP project, being an international project, is classified as of national importance.

The pipeline is crossing the National Park for approximately 42 km, through the northernmost part of the site, in the peripheral zone of the National Park and the outer limits of the overlapping protected areas (see *Annex 4*). It is highlighted that the National Park includes many overlapping areas. For example, Zone A, WRA of Kotza Orman Nestou and SAC GR1150010 (and the corresponding Ramsar site) are overlapping for almost their entire area (see *Table 6-100* and *Figure 6-88*).

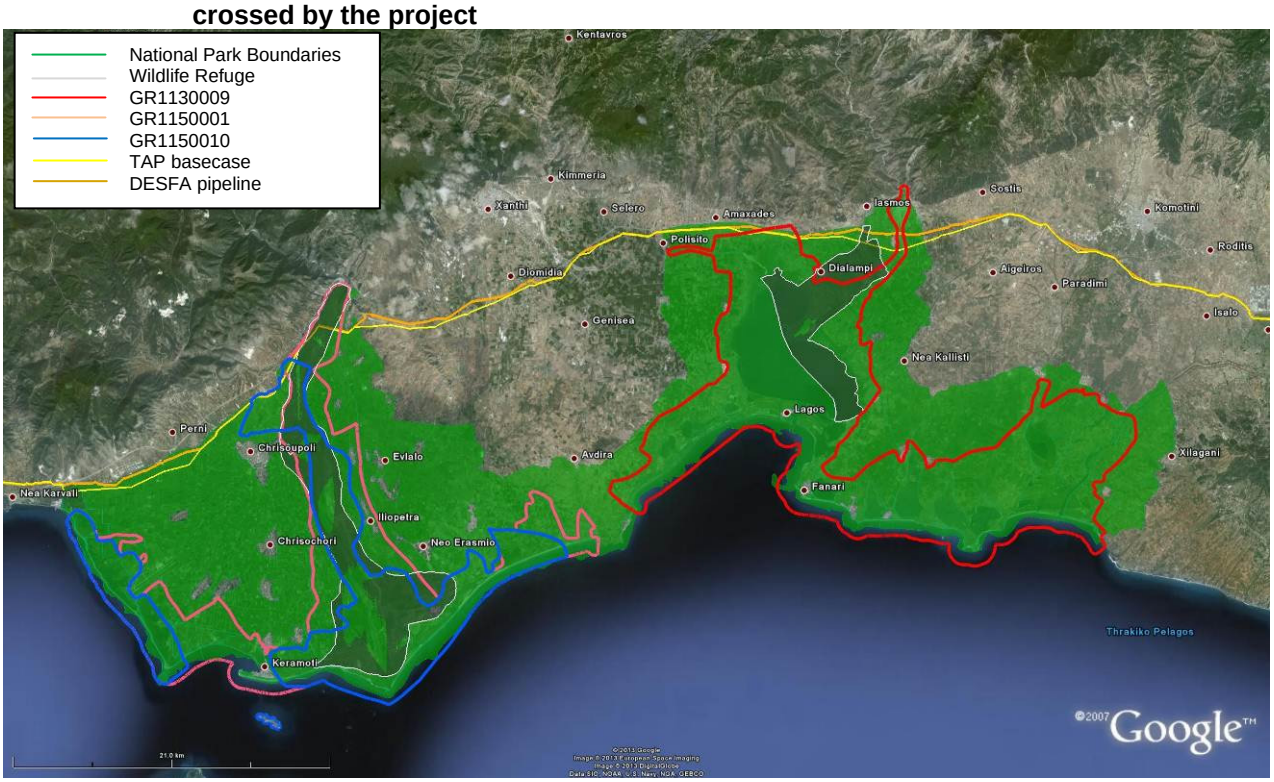
In this area, the project follows the existing DESFA pipeline for approximately 70 % of its length. In many cases, the bundling with the existing DESFA pipeline is for the entire length within a specific area of the National Park. This is specifically the case for the Zone A of the National Park, the WRA of Kotza Orman Nestou and GR1150001 and GR1150010.

Table 6-100 Management Zones and Protected Areas within the National Park of Eastern Macedonia – Thrace crossed by the pipeline

Area Within the Complex of National Park of Eastern Macedonia and Thrace	*From KP*	*To KP*	*Length (m)*	*Bundling with the Existing DESFA pipeline*
ZONE A of National Park	153+400	153+900	517.6	100 %
ZONE B of National Park	112+500	112+900	401.59	TAP is at a maximum distance of 1000 m from the existing pipeline
ZONE B of National Park	120+000	123+400	3,404.61	58 %
ZONE B of National Park	152+500	153+400	866.45	100 %
ZONE B of National Park	153+900	159+700	5,761	93 %
Total Length through Zone B of National Park			*10,434*	*79 %*
ZONE C of National Park	111+300	112+500	1,205	TAP is at a maximum distance of 950 m from the existing pipeline
ZONE C of National Park	112+900	120+000	7,099	TAP is at a maximum distance of 1200 m from the existing pipeline
ZONE C of National Park	123+400	129+000	5,661	78 %
ZONE C of National Park	151+200	152+500	1,334	77 %
ZONE C of National Park	159+700	175+300	15,568	37 %
Total Length through Zone C of National Park			*30,868*	*37 %*
ZONE D of National Park	175+300	176+000	709	TAP is at a maximum distance of 550 m from the existing pipeline
WRA Periochi Kompsatou	114+400	115+800	1,390	TAP is at a distance of approximately 700 m from the existing pipeline
WRA Kotza Orman Nestou	153+100	156+300	3,160	100 %
Total Length through WRA within the National Park			*4,550*	*69 %*
SAC GR1130009 (and the corresponding Ramsar site)	112+600	113+200	620	TAP is at approximately 1000 m from existing pipeline
SAC GR1130009 (and the corresponding Ramsar site)	119+900	123+500	3,650	54 %
		Sub-Total	4,270	47 %
SAC GR1150010 (and the corresponding Ramsar site)	152+700	158+000	5,310	100 %
SPA GR1150001	156+900	161+200	4,270	100 %
Total Length through NATURA 2000 sites within the National Park			*12,770*	*41 %*
TOTAL LENGTH THROUGH THE NATIONAL PARK OF EASTERN MACEDONIA AND THRACE COMPLEX			**42,528.5**	**71 %**

Source: ASPROFOS (2013)

Figure 6-88 Overlapping protected areas inside National Park of Eastern Macedonia – Thrace crossed by the project



Source: ASPROFOS (2013). Background Google Earth.

In all, the complex of the National Park of Eastern Macedonia – Thrace includes the following protected areas:

- GR1130009 (SAC) 'LIMNES KAILIMNOTHALLASES TIS THRAKIS – EVRYTERIPERIOCHI KAI PARAKTIAZONI'. Also a Ramsar Site. The wetlands under consideration are seen either as one ecological unit and a great wetland complex, or as each one separately still having a great ecological value for Greece and Europe. Their diversity in biotopes and wildlife species is remarkable, as well as the important bird populations that exist there. Several bird species have their national strong holds here. Moreover, the total Greek and European populations of other bird species, breed in these wetlands, that are also protected by the Ramsar Convention. They also included as an IUCN Directory site and are classified as a Type I Bird site. The pipeline length intersecting the area is approximately 4.3 km.
- GR1150001 (SPA) 'DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS KAI NISOS THASOPOULA'. It is the most important wetland because of the large area that it occupies and because of its rich habitat-types. Nowadays, it is still is a valuable part of a wetland chain included between AxiosRiver and Delta of Evros of north Greece. Ornithologically, it is still an important breeding site for spur-winged plover (*Hoplopterus*

spinosus) (largest breeding population in Europe), purple heron, (*Ardea purpurea*) etc. It is also important for migratory waterfowl and lesser spotted Eagles which winter there. From an ichtyological point of view especially the wider part of the river mouth is an important spawning and nursery ground for several commercially, intensively used species (Seabream, Seabass, Mullet, Eel, etc.). The pipeline length intersecting the area is approximately 4 km.

- GR1150010 (SAC) 'DELTA NESTOU KAI LIMNOTHALASSESKERAMOTIS - EVRYTERIPERIOCHI KAI PARAKTIAZONI'. Also a Ramsar site. The wetland is important from an ornithological point of view because of the large area that it occupies and because of its rich habitat types. Moreover, it is a valuable part of a chain of wetlands located between AxiosRiver and Delta Evrou in northern Greece. The riparian forest and the coastal area are important for breeding, the lagoons for migrating and the river for the wintering of many species as grebes, ducks, herons, cormorants, pygnies, raptors, geese, flamingos, waterfowl and others.The pipeline length intersecting the area is approximately 4.8 km.

- Wildlife Reserve of Kompsatos. The Wildlife Reserve (HGG B 842/2001) has an area covering 3800 hectares. The area consists mainly of by arable land interrupted by semi-natural hedges and a seasonal stream, settlements and degraded pastures. Some indicative habitat types/ecosystems are: Synanthropic vegetation and unvegetated sand bed. Dominant species in terms of flora include: *Ononis spinosa, Solanum eleagnifolium, Trifolium angustifolium, Silybum marianum, Marrubium peregrinum, Scirpus holoschoenus, Kickxia spuria, Galium verum, Portulaca oleracea, Cynodon dactylon, Sorghum halepense*.Most of the plant taxa are very common and synanthropic species. Species of fauna include: *Canis aureus, Meles meles, Martes foina, Felis sylvestris.* The pipeline length intersecting the area is approximately 500 m.

- Wildlife Reserve of Kotza-Orman. The Wildlife Reserve (HGG B 132/1986) has an area covering 8022 hectares. The area consists mainly of a complex of arable land interrupted by semi-natural hedges, riparian forests, NestosRiver, and water ponds cover by reedbeds. Some indicative habitat types/ecosystems are: Synanthropic vegetation, arable land, Salix alba - Populus alba galleries (code 92A0, Annex I, Directive 92/43/EEC). Dominant species in terms of flora include: *Salix alba, Saponaria officinalis, Platanus orientalis, Phragmites australis, Alnus glutinosa, Plantago major, Cynanchum acutum, Hedera helix, Phytolacca americana, Humulus lupulus, Galium aparine, Cornus sanguinea, Ranunculus peltatus*.Most of the plant taxa are very common and synanthropic species. Species of fauna include: *Sus scrofa, Canis aureus, Meles meles Lepus europaeus, Martes foina, Felis sylvestris.* The pipeline length intersecting the area is approximately 3.6 km.

- Ramsar site of Lakes Vistonis, Porto Lagos, Lake Ismaris & adjoining lagoons. It was included in the Ramsar convention on 1975. Prior to December 1996, there were two separate Ramsar sites, LakeVistonis and LakeMitrou, which were merged to form the current site.The site includes a wetland complex, encompassing a coastal lake (Vistonis), the Porto Lagos saline lagoon, six shallow saltwater adjoining lagoons separated from the sea by a sandy beach, and a freshwater shallow lake (Ismaris). The coastal lagoons are fringed by saltmarsh, extensive mudflats, reedbeds and scrub, and freshwater marsh. The area is important for breeding birds, and large numbers of various species of waterbirds occur in winter, such as *Pelecanus crispus* and *P. onocrotalus*. Human activities include commercial fishing, livestock grazing, groundwater exploitation, recreation and hunting. The pipeline does not traverse the area.

More details are provided in the Appropriate Assessments of these Natura 2000 sites (see Annexes *8.9 and 8.10).*

6.3.4.1.4 National Park of Lakes Koronia - Volvi

The park was established in 2004 (HGG 248/05.03.2004) whilst its Management Body in 2002 with the Law 3044. It covers an overall area of approximately 208000ha. There are three (3) zones of different levels of protection: Zone A (A1: *Strict nature reserve* and A2: *Nature reserve),* Zone B (*Peripheral zone),* and Zone C (also *Perihperal zone).* In general, Class A projects are not allowed to cross through boundaries of the National Park. Exceptions exist for projects of national importance. TAP project, being an international project, is classified as of national importance.

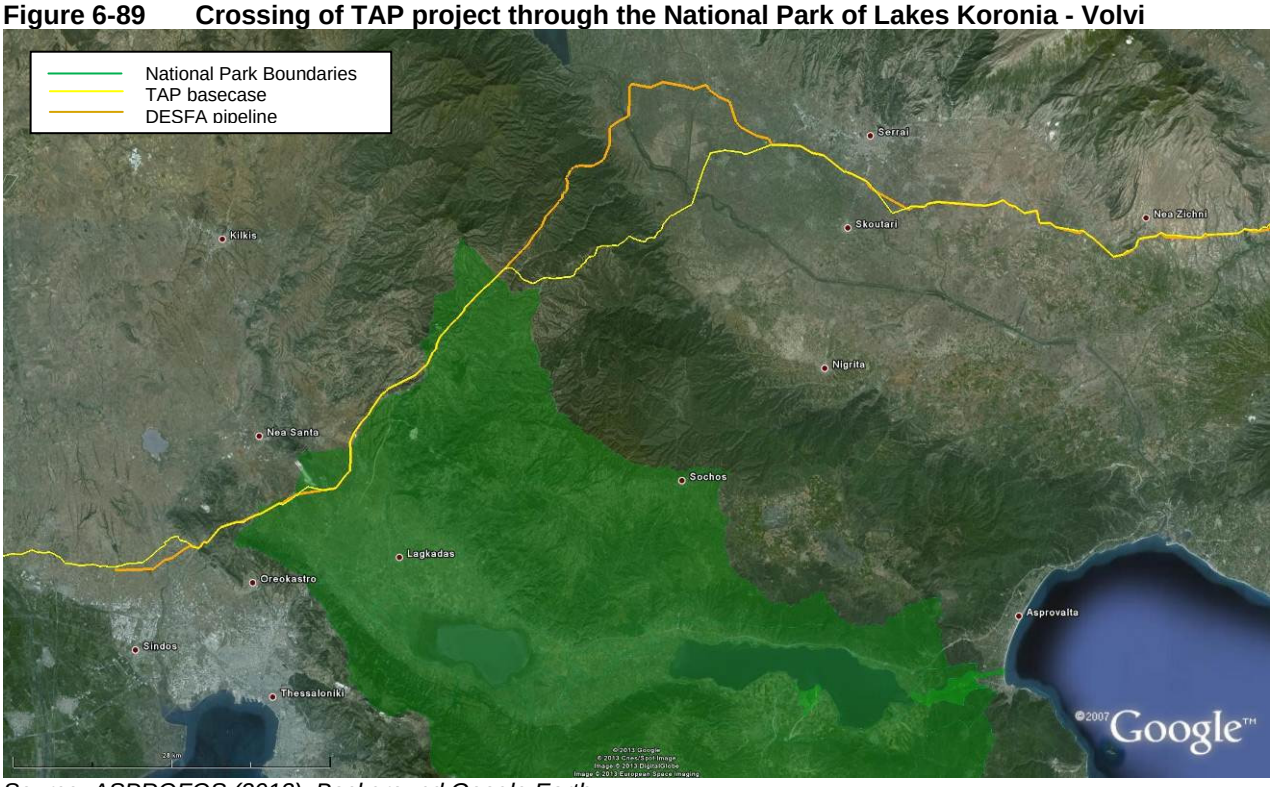
The proposed pipeline crosses the northern most part of the complex, in the peripheral zone of the National Park for approximately 23 km. Nevertheless, in this area, as described in *Table 6-101* and *Figure 6-89* the project follows the existing DESFA pipeline for 81 %.

Table 6-101 Management Zones within the National Park of Lakes Koronia – Volvi, crossed by the pipeline

Area Within the Complex of National Park of Lakes Koronia Volvi	*From KP*	*To KP*	*Length (m)*	*Bundling with the Existing DESFA pipeline*
ZONE C of National Park	312+400	322+700	10,310	100 %
ZONE C of National Park	328+200	329+500	1,250	100 %
ZONE C of National Park	332+400	344+100	11,700	62 %
TOTAL LENGTH THROUGH THE NATIONAL PARK OF EASTERN MACEDONIA AND THRACE COMPLEX			**23,260**	**81 %**

Source: ASPROFOS (2013)

Figure 6-89 Crossing of TAP project through the National Park of Lakes Koronia - Volvi



Source: ASPROFOS (2013). Background Google Earth.

The complex of the National Park of Lakes Koronia and Volvi includes the following protected areas:

- GR1220009 (SPA) LIMNES KORONEIAS - VOLVIS, STENA RENTINAS KAI EVRYTERI PERIOCHI. The two lakes of the site are connected to each other by a canal which is not functional nowadays. The related malfunctions to the canal, the rivulet embankments and the drainage works due to extensive cultivation, gradually drain off Koroneia (Langada) lake into VolviLake. The water level of the former has been reduced to 0.5 m. The latter, is also connected to the sea by RicheiosRiver which passes through a gorge with precipices and rocks, surrounded by dense, high maquis of extraordinary composition and

high plane trees along the river banks. The two lakes are characterised by dissimilar indexes of land uses, eutrophication and urbanization, with lake Langada (Koroneia) being more threatened. However, two large streams, i.e. Apollonia and Mellisourgos, flow into the lake Volvi and result in sedimentation. Locally extensive reed beds occur around the lakes and along the rivulet banks. Small linear and mosaic type wood areas are found within the site. Between the two lakes, the very old *Platanus orientalis* trees are found with important colonies of grey herons and the riparian forest of Apollonia, where a large number of animals, including birds, find refuge. The surrounding hilly and mountainous area, along with cultivated land, support good numbers of birds of prey (Lesser Spotted and Booted Eagle, Long-legged Buzzard, Lanner, etc) and other protected species such as the Black Stork, the Roller and the Calandra Lark. The base case route does not traverse the area.

- GR1220001 (SAC) LIMNES VOLVI KAI LAGKADA - EVRYTERI PERIOCHI. In addition to what has been previously mentioned for the two lakes, individuals of the bird species Phoenicopterus ruber have been regularly recorded from Lake Koroneia in the recent years. They have tried twice to nest in this area with no indications of success. Extensive reed beds of Scirpus maritimus and Phragmites australis occur around the lakes and along the rivulet banks. Small linear and mosaic type wooded areas (groves, hedges, tree lines) are found within the site. Between the two lakes two very old plane (P. orientalis) trees with important colonies of grey herons are found in Scholari. In addition, in the area of N. Apollonia, the plane tree where the Apostle Paul spoke stands. In both lakes, geothermal phenomena appear which are used as thermal waters in the Langadas and Apollonia thermal spas. The base case route does not traverse the area.

- GR1220003 (SAC) STENA RENTINAS - EVRYTERI PERIOCHI. The site lies along the borderline of two different climatic zones of Greece. The one to the south, is characterized by mediterranean climate, while the other, indicates the invasion of the continental climate to the northern part of Greece. The site is a gorge surrounded by dense and high maquis of extraordinary composition of evergreen wood species (including *Quercus ilex*). High plane trees (*Platanus orientalis*) are growing wild along the RicheiosRiver. The river connects LakeVolvi to the Strymonikos gulf. A water dam is located at the upper part of Richeios River whose malfunctioning affects fish populations and their free circulation from the lake to the sea and backwards. Colonies of bats are found in the area. Finally, there are archaeological findings, of which the most important is the Rentina castle. The base case route does not traverse the area.

- Ramsar site of Lakes Volvi & Koronia. It was included in the Ramsar convention on 1975. It refers to the two freshwater lakes connected by a narrow channel, fringed by reedbeds, patches of woodland, and surrounded by arable land. The area supports endemic fish, nesting waterbirds, and large numbers of wintering birds including Anatidae (geese, ducks, swans, etc.). Several nationally rare or endangered aquatic plants occur. There

are many settlements around the lakes and human activities include irrigation, agriculture, livestock grazing, fishing and hunting. The base case route does not traverse the area.

6.3.4.1.5 Axios – Loudias - Aliakmonas Estuaries National Park

The Axios - Loudias - Aliakmonas Estuaries National Park has been recognised as a wetland of major ornithological interest since the beginning of the 1970s when it was declared a Ramsar site. Breeding species of conservation interest include: *Phalacrocorax pygmeus, Ixobrychus minutus, Nycticorax nycticorax, Ardeola ralloides, Egretta garzetta, Ardea purpurea. Platalea leucorodia, Tadorna tadorna, Haematopus ostralegus, Himantopus himantopus, Recurvirostra avosetta, Glareola pratincola, Charadrius alexandrinus, Larus melanocephalus, Sterna albifrons, St. hirundo* and *Calandrella brachydactyla*.

In addition, the area hosts significant numbers of threatened and rare bird species, while wintering and migrating. Parts of the delta and the rivers, as well as sea water of up to 6 m in depth serve as spawning grounds for fish populations of the Thermaikos Gulf and North Aegean Sea. The area hosts at least two mammal species (*Spermophilus citellus, Lutra lutra*) and several reptile species protected according to Directive 92/43/EC. Lycaena dispar (a butterfly species protected according to Directive 92/43/EC) is also known from the wet lowlands. The area comprises extensive reedbeds, rice fields, lagoons and canals. For most species the vital habitats are concentrated on the delta zone fringing the coast that is the part enclaved by the “strict nature reserve”.

As is shown in Table 6-102, the National Park is divided into three sub-zones of management: (i) Strict Nature Reserve, (ii) Nature Reserves and (iii) Cultivations.

Table 6-102 Management Zones within the Axios – Loudias – Aliakmonas Estuaries National Park

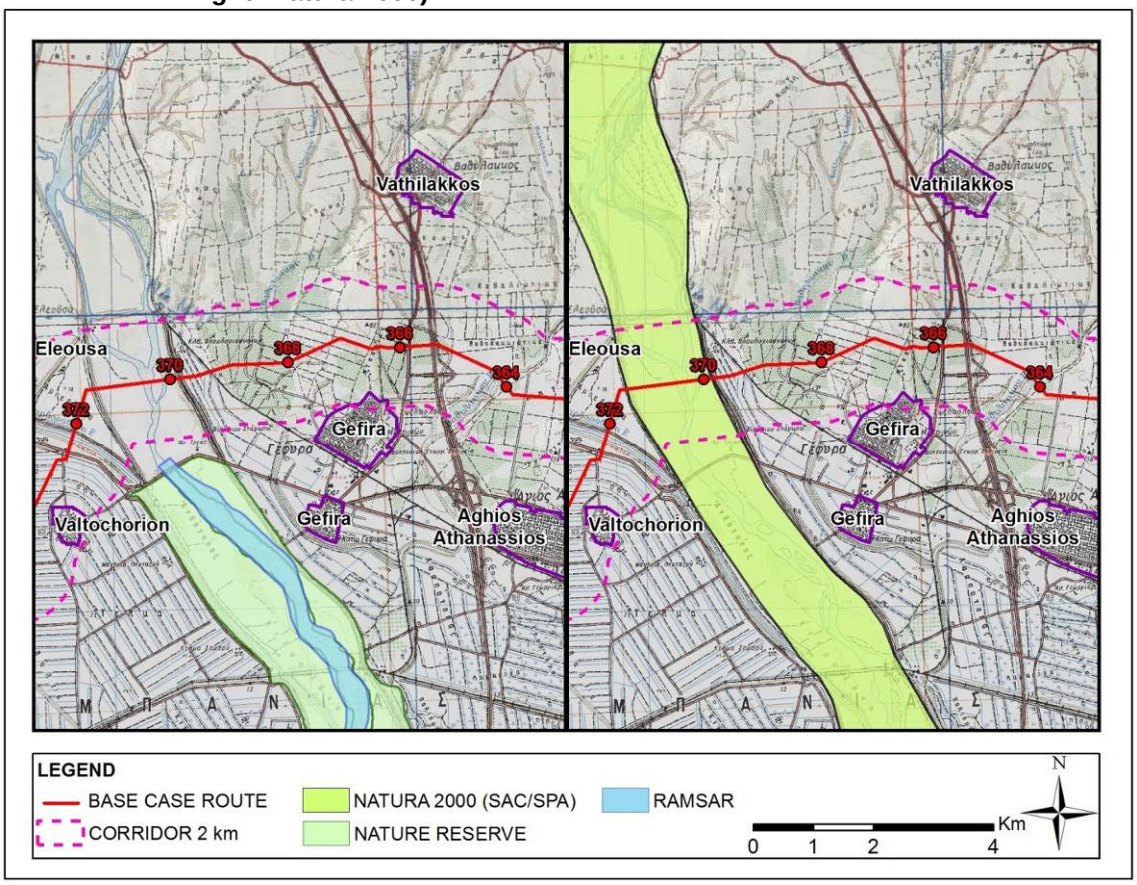
Zone type	*Area (ha, approx)*
Strict nature reserve	3,549
Nature reserves	14,664
Cultivations	13,744

Source: Ministry of Environment (2011)

The 2 km study corridor of the pipeline extends into the northernmost extent of an area identified as a nature reserve along the Axios River (*Figure 6-90*).

Although the pipeline route does directly cross the Natura 2000 site (a 1.4 km section from KP 369.8 to 371.2) the crossing will be trenchless to avoid construction activities within the conservation designated area..

Figure 6-90 Protected Areas at the Axios River Crossing (Left: National Park and Ramsar site / Right: Natura 2000)



Source: ERM (2011)

6.3.4.2 Areas of Conservation Interest

6.3.4.2.1 Important Bird Areas (IBAs)

IBAs are key sites for conservation. They are small enough to be conserved entire and are often already part of a protected-area network. They bear one (or more) of the three following characteristics:

- Hold significant numbers of one or more globally threatened bird species.
- Are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species.
- Have exceptionally large numbers of migratory species or species that congregate together.

All IBAs that are within the study area comprise part of the Natura 2000 network, therefore they are already under a particular protection status. The species criteria which indicate the conservation interest for these sites that are in proximity with the proposed routing of the pipeline are shown in the following (*Table 6-103*). The distribution of IBAs within the study area can be seen in *Figure 6-91* for the East section and in *Figure 6-92* for the west section.

Table 6-103 IBAs and Species-Criteria within the Project Region

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***
GR005South forest complex of Evros prefecture		
Neophron percnopterus	breeding	3 – 4 b. p.
Aegypius monachus	passage	
Circaetus gallicus	breeding	8 -10 b. p.
Buteus rufinus	resident	6 – 9 b.p.
Aquila pomarina	breeding	7 – 8 b.p.
Aquila clanga	wintering	15 – 20 indiv.
Aquila heliaca	wintering	4 – 6 indiv.
Aquila chrysaetos	resident	3 – 4 b.p.
Hieraaetus pennatus	breeding	6 – 7 b.p.
Bubo bubo	resident	3 – 4 b.p.
Lanius nubicus	breeding	abundant
Hippolais olivetorum	breeding	abundant
Phylloscopus bonelli	breeding	abundant
Sylvia melanocephala	resident	abundant

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***
Sylvia cantilans	breeding	abundant
Sylvia neuayer	resident	-
Oenanthe hispanica	breeding	common
Emberiza caesia	breeding	Frequent
Emberiza melanocephala	breeding	abundant
GR009 Kompsatos Valley		
Dendrocopos syriacus	resident	common
Phalacrocorax pygmeus	wintering	20- 40 b.p.
Ficedula semitorquata	breeding	rare
Emberiza hortulana	breeding	common
GR010 Ismarida		
Cygnus olor	wintering	500- 1400 b.p.
Anser erythropus Lesser	wintering	20- b.p.
Tadorna ferruginea	resident	uncommon
Tadorna tadorna	wintering	800- 2,500 b.p.
Anas penelope	wintering	1,500- 6,000 b.p.
Aythya nyroca	resident	common
Merops apiaster	breeding	abundant
Numenius tenuirostris	Passage	-1 b.p.
Burhinus oedicnemus	breeding	common
Recurvirostra avosetta	wintering	700- 2,500 b.p.
Vanellus spinosus	breeding	-4 b.p.
Glareola pratincola	breeding	20- 100 b.p.
Larus melanocephalus	breeding	-600 b.p.
Larus minutus	passage	-1,200 b.p.
Chlidonias hybridus	breeding	30- 110 b.p.
Podiceps nigricollis	wintering	-1,000 b.p.
Phalacrocorax pygmeus	resident	frequent
Phalacrocorax pygmeus	wintering	110- 350 b.p.
Phalacrocorax carbo	wintering	700- 2,500 b.p.
Casmerodius albus	wintering	-280 b.p.
Ardeola ralloides	breeding	-80 b.p.
Ixobrychus minutus	breeding	20- 50 b.p.
Phoenicopterus ruber	passage	1,500- 5,500 b.p.
Plegadis falcinellus	passage	50- 2,500 b.p.
Platalea leucorodia	resident	-110 b.p.
Pelecanus crispus	passage	abundant
GR011 Lakes of Thrace		
Oxyura leucocephala	wintering	- 2,300 b. p.

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***
Cygnus olor	wintering	- 800 b. p.
Anser erythropus	wintering	- 40 b. p.
Tadorna tadorna	wintering	250 – 1,200 b. p.
Aythya ferina	wintering	3,000 – 14,000 b. p.
Aythya nyroca	resident	Frequent
Merops apiaster	breeding	Abundant
Fulica atra	wintering	2,000 -29,000 b. p.
Numenius tenuirostris	passage	- 1 b. p.
Burhinus oedicnemus	breeding	Abundant
Recurvirostra avosetta	resident	Abundant
Charadrius alexandrinus	resident	Abundant
Vanellus spinosus	breeding	5 – 15 b. p.
Glareola pratincola	breeding	Abundant
Larus melanocephalus	breeding	- 400 b. p.
Sterna albifrons	breeding	Abundant
Tachybaptus ruficollis	wintering	- 2,000 b. p.
Podiceps nigricollis	wintering	1,150 – 6,000 b. p.
Phalacrocorax pygmeus	wintering	2,350 – 3,300 b. p.
Phalacrocorax carbo	wintering	- 2,200 b. p.
Casmerodius albus	wintering	45 – 550 b. p.
Ixobrychus minutus	breeding	50 – 150 b. p.
Phoenicopterus ruber Greater	wintering	1,500 -5,000 b. p.
Plegadis falcinellus Glossy *Ibis*	passage	- 400 b. p.
Pelecanus crispus	wintering	120 – 250 b. p.
Pelecanus crispus	passage	350 -700 b. p.
Ciconia ciconia	breeding	80 – 130 b. p.
Puffinus yelkouanYelkouan	wintering	- 500 b. p.
Lanius minor	breeding	Abundant
Lanius nubicus	breeding	Common
Calandrella brachydactyla Greater	breeding	Abundant
GR012 Nestos Delta		
Cygnus olor	wintering	200 – 1,300 b. p.
Anser erythropus	wintering	- 26 b. p.
Aythya nyroca	passage	Abundant
Dendrocopos syriacus	resident	Abundant
Numenius tenuirostris	passage	Rare
Burhinus oedicnemus	breeding	20 – 40 b. p.
Charadrius alexandrinus	resident	40 – 70 b. p.
Vanellus spinosus	breeding	25 – 33 b. p.

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***
Glareola pratincola	breeding	20 – 100 b. p.
Larus melanocephalus	breeding	300 – 700 b. p.
Sterna albifrons	breeding	80 – 450 b. p.
Accipiter brevipes	breeding	10 - b. p.
Aquila clanga Greater	wintering	4 – 16 b. p.
Falco naumanni	passage	Abundant
Phalacrocorax pygmeus	resident	Common
Phalacrocorax pygmeus	wintering	250 – 1,800 b. p.
Phalacrocorax carbo	wintering	150 – 3,300 b. p.
Phalacrocorax aristotelis	resident	- 50 b. p.
Casmerodius albus	wintering	120 – 500 b. p.
Ixobrychus minutus	breeding	Abundant
Pelecanus crispus	passage	Abundant
Pelecanus crispus	wintering	10 – 35 b. p.
Ciconia ciconia	breeding	Abundant
Puffinus yelkouanYelkouan	wintering	- 400 b. p.
Lanius minor	breeding	Abundant
Lanius nubicus	breeding	Common
Calandrella brachydactyla	breeding	Abundant
GR032 Lakes Volvi - Koronia		
Aythya ferina	wintering	8,029 – 8,029 b. p.
Himantopus himantopus	passage	- 600 b. p.
Recurvirostra avosetta	passage	- 1,150 b. p.
Accipiter brevipes	breeding	Uncommon
Podiceps cristatus	wintering	6,729 – 6,729 b. p.
Phalacrocorax pygmeus	wintering	43 – 43 b. p.
Casmerodius albus	wintering	35 – 35 b. p.
Phoenicopterus ruber	non-breeding	- 1,410 b. p.
Pelecanus crispus	passage	- 473 b. p.
Pelecanus crispus	wintering	249 – 249 b. p.
Ciconia ciconia	breeding	80 – 100 b. p.
GR025 River Axios (Axios plane section)		
Phalacrocorax pygmeus	wintering	>5,000
GR028 Axios, Loudias and Aliakmon rivers' deltas (Axios plane section)		
Limosa limosa	passage	100-4,000
Numenius tenuirostris	passage	>1
Haematopus ostralegus	resident	5-15 pairs
Himantopus himantopus	summer visitor	100-150 p

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***
Recurvirostra avocetta	resident	50-70 p
Charadrius alexandrinus	resident	50-100 p
Glareola pratincola	summer visitor	50-100 p
Larus cachinnans	wintering	<5.000
Larus melanocephalus	summer visitor	800-1,400 p
Sterna albifrons	summer visitor	70-130 p
Phalacrocorax pygmeus	wintering	>5,000
Egretta garzetta	resident	274-700 p
Ardeola ralloides	summer visitor	150-300 p
Nycticorax nycticorax	summer visitor	420-800 p
Ixobrychus minutus	summer visitor	30-80 p
Platalea leucorodia	resident	16-50 p
Pelecanus crispus	passage	5-50
Calandrella brachydactyla	summer visitor	Frequent
GR045 Lakes Vegoritis and Petron (Vermio Mountain slopes section)		
Phalacrocorax pygmeus	resident	3-10 p
GR046 Lakes Cheimaditis and Zazari (Ptolemaida Basin section)		
Tachybaptus ruficollis	resident	13-20 p
Podiceps cristatus	resident	34-40 p
Ixobrychus minutus	summer visitor	c. 50 p
Ardea purpurea	summer visitor	3-4 p
Anas crecca	resident	2-5 p
Anas platyrhynchos	resident	15-20 p
Aythya ferina	resident	20-25 p
Aythya nyroca	summer visitor	15-20 p
Circus aeruginosus	summer visitor	3-4 females
Circus pygargus	summer visitor	>2 p
Aquila chrysaetos	resident	1 p
Merops apiaster	summer visitor	15-20 p
GR048 Lake Kastoria (Kastoria-to-border area section)		
Aythya nyroca	summer visitor	<30 p
Mergus merganser	wintering	5-10
Phalacrocorax pygmeus	wintering	<500
Ardeola ralloides	summer visitor	10-50 p
Pelecanus crispus	passage	50-100
GR051 Mount Vourinos (Vermio Mountain slopes section)		
Falco biarmicus	resident	Rare
Aquila heliaca	resident	Rare

Species – criteria	***Status[1]***	***Number (b.p. = breeding pairs)***

Note: [1]: The status of these species within the project area in particular is discussed in detail in Section 6.3.3 and Annex 6.5.5

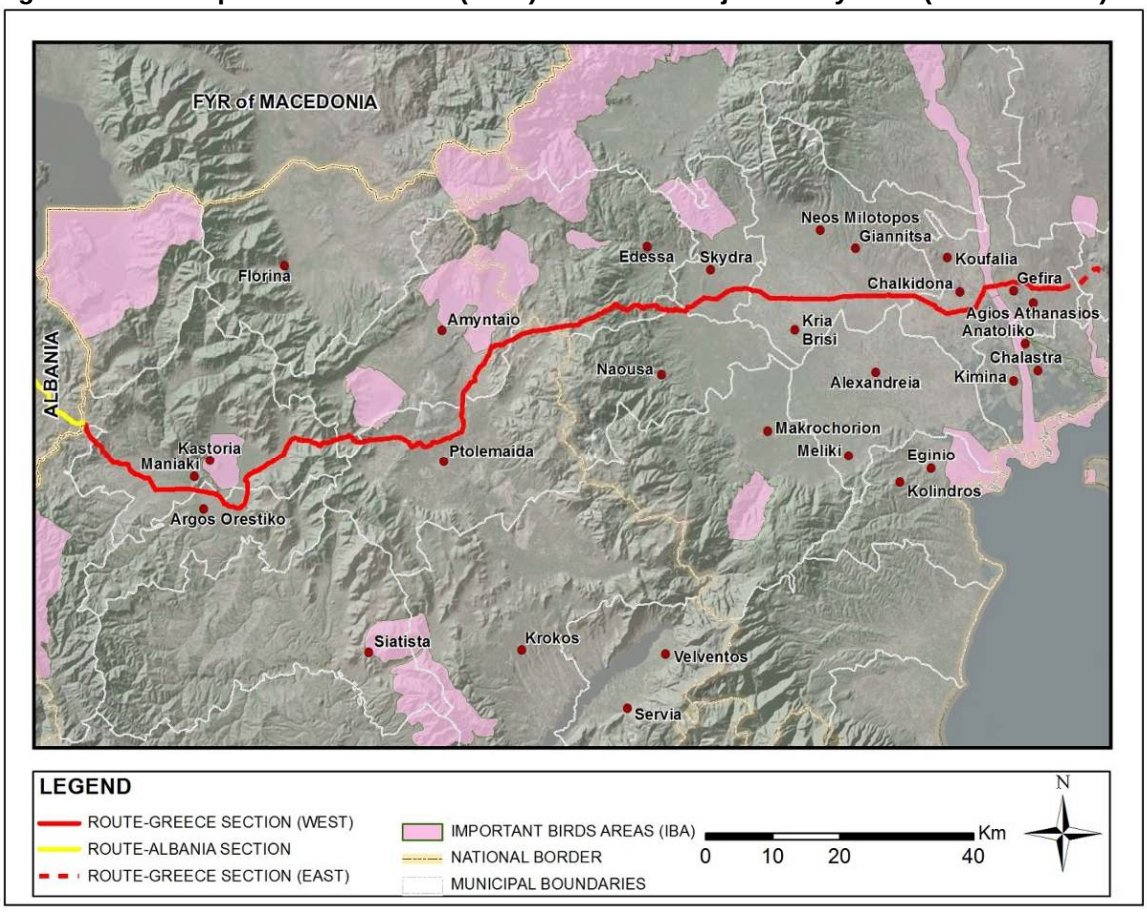
Source: http://www.birdlife.org/datazone/country/greece/ibas *[Accessed: February – March 2012, January 2013]*

Figure 6-91 Important Bird Areas (IBAs) within the Project Study Area (for East Section)



Source: NCC (2013)

Figure 6-92 Important Bird Areas (IBAs) within the Project Study Area (West Section)



Source: Hellenic Ornithological Society (2010)

6.3.4.2.2 CORINE Sites

The CORINE Biotopes are particular areas that have been identified as ”major nature sites” across Europe by the European Environment Agency (EEA) and include sensitive or rare habitats, vulnerable ecosystems and species of importance. In the European context, the CORINE Biotope Sites (and in general CORINE programs) will be one of the criteria for the studies towards the selection and establishment of protected areas: indeed, several CORINE sites have been incorporated in the Natura 2000 network currently operating within the EU. It should be emphasized that CORINE Biotopes do not have a protection status themselves, but only constitute areas of conservation interest. All CORINE areas within the Study area have been either incorporated in the Natura 2000 network or they are outside the 2 km corridors.

6.3.4.2.3 Other sites of Conservation Interest (FILOTIS database, Areas of High Landscape Value)

Few designated sites as 'Areas of High Landscape Value' exist in the broader area of the Project. These areas are usually included in a broader protected legal framework, such as a Natura 2000 site. Table 6-104 presents the Areas of High Landscape Value, in the vicinity of the Project. Lehovo, Kleisoura, and Variko (AT4011023), which comprises a montane valley with extended deciduous forest which is crossed by the project for approximately 5 km. Lehovo, Kleisoura and Variko are historic settlements within the valley and along the hills and mountains of the area.

Table 6-104 Designated Areas of High Landscape Value in the vicinity of the base case route.

s/n	KP	Distance (m)	Site Code	Name	Protected Status
1	135	7,000	AT5010006	Old Town of Xanthi	• Preserved Settlement/ Buildings
2	154	3,000	AT5011065	'Nestos' straights (Tempi of Thrace)	• Aesthetic Forest • Natura2000 • Wildlife Reserve
3	185	800	AT4011109	'Aesthetic Forest of Kavala – Amygdaleona'	• Aesthetic Forest • Wildlife Refuge
4	205	8,000	AT4011050	'Eleftheroupoli of Kavala'	• Preserved Settlement/ Buildings
5	210	5,000	AT4011048	MountPaggaio	• Archaeological Site • Natura2000 • Wildlife Refuge
6	235	500	AT4011002	Aggitis' River Gorge	• Wildlife Refuge
7	488	0 (crossed for approx. 5.5 km)	AT4011023	Lehovo, Kleisoura, Variko	-

Source: ASPROFOS (2013), ERM (2013)

6.3.4.2.4 Sites protected within the auspices of the Ministry of Agriculture (Forestry Agency): Wildlife Refuges / free-range wildlife farms

The Study Area crossed the following Wildlife Refuges:

- Wildlife Refuge Kavisos – Pylaia: the pipeline proceeds along the border line of the refuge (KP 15– 16)
- Free-range wildlife farm at Kirki the pipeline enters the site along approx 5 km (KP 50– 55)

- Wildlife Refuge Hatisio: (KP 98-100)
- Wildlife Refuge Kompsatos: (KP 114-116)
- Wildlife Refuge Kotza – Orman (Nestos): (KP 152- 156)
- Wildlife Refuge Agios – Timotheos - Kioupia: (KP 186– 191)
- Wildlife Refuge Petroto: (KP 235- 240)
- Wildlife Refuge Dimitritsio: (KP 280- 310)
- Flamouria – Grammatiko on Vermio Mountain: (KP 433.3-438.4)
- Kouri in Eordea plateau: (471.0-479.0)

6.3.4.2.5 Other Natura Areas outside the Pipeline 500 m Corridor

The following Natura Areas can be found within proximity of the proposed TAP route but are outside the 500 m corridor:

- GR 1110007 River Evros and Dytikos Vrachionas (SCI) – minimum distance approximately 3.0 km: There is strong conservation interest mainly regarding the avian populations breeding or wintering in the area.
- GR 1110005 Vouna Evrou (SCI) – minimum distance approximately 3.3 km: There is strong conservation interest mainly regarding the avian populations breeding or wintering in the area as well as mammals, reptiles and amphibians.
- GR1210001 Vermio (SCI) – minimum distance approximately 2.0 km: The mountain area of this protected site is characterised by extensive beech and oak forest; *Pinus nigra* forest is also extended. The lowland area comprises forest of *Ostria caprinifolia*, *Caprinus*, *Quercus* and patches of *Castanea sativa*. Meadows and grasslands are interspersed among the forests.
- GR 1340004 Vegoritida and Petron Lake (SCI) – minimum distance approximately 0.3 km: The lacustrine environment hosts several types of riparian vegetation. In the area *Spermophillus citellus* is also present.
- GR1340005 / 0008 Cheimatidida and Zazari Lakes (SCI / SPA) – minimum distance approximately 1.8 km: The two lakes are connected through a canal and hosts a significant population of avifauna. Cheimaditida Lake has extensive *Phragmites* formation.
- GR1320001 / 0003 Kastoria Lake (SCI / SPA) – minimum distance approximately 0.5 km: The lacustrine environment hosts several types of riparian vegetation. The Lake is also important for several avifaunal species.

6.3.4.2.6 Summary of Protected Areas

Table 6-105 summarizes the protected areas, under European and National legislation that are crossed by the pipeline route and could potentially be affected by the Project. It must be noted that especially for the area of National Park of Eastern Macedonia and Thrace, there are many protected areas overlapping.

The TAP Project has adopted the bundling principle, which means that the pipeline route runs in parallel with the existing DESFA pipeline as far as possible. In total, the Project bundles with the DESFA pipeline for almost 47 % of its length through protected areas. Specifically, for the Natura 2000 sites and the National Parks, this percentage exceeds 80 %.

Table 6-105 Protected areas potentially affected by the project

CODE	*TYPE/ ZONE*	*OFFICIAL NAME*	*LENGTH (km)*	*FROM KP*	*TO KP*	*Bundling with the Existing DESFA pipeline*
NATURA 2000						
GR1110009	SPA	NOTIO DASIKO SYMPLEGMA EVROU (SOUTH FOREST COMPLEX OF EVROS)	12.50 1.08	21+400 49+700	33+900 50+800	100 % 100 %
TOTAL LENGTH (km) THROUGH GR1110009			13.57			100 %
GR1130006	SAC	POTAMOS FILIOURIS (FILIOURIS RIVER)	0.31	76+400	76+800	100 %
GR1130009	SAC	LIMNES KAI LIMNOTHALASSES TIS THRAKIS - EVRITERI PERIOCHI KAI PARAKTIA ZONI (LAKES AND LAGOONS OF THRACE - BROADER AREA AND COASTAL ZONE	0.62 3.65	112+600 119+900	113+200 123+500	n/a 54 %
	TOTAL LENGTH (km) THROUGH GR1130009		4.27			46%
GR1150001	SPA	DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS KAI NISOS THASOPOULA (DELTA OF NESTOS AND LAGOONS OF KERAMOTI AND THASOPOULA ISLAND)	4.27	156+900	161+200	100 %
GR1150010	SAC	DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS - EVRITERI PERIOCHI KAI PARAKTIA ZONI (DELTA OF NESTOS AND LAGOONS OF KERAMOTI - BROADER AREA AND COASTAL ZONE)	5.31	152+700	158+000	100 %
GR1220002 / GR1220010	SPA/ SAC	DELTA AXIOU, LOUDIA, ALIAKMONA, ALYKI KITROUS/ DELTA AXIOU, LOUDIA, ALIAKMONA, EYRYTERI PERIOCHI AXIOUPOLIS	1.40	369+800	371+200	n/a
TOTAL LENGTH (km) THROUGH NATURA SITES			**29.13**			**86 %**
NATIONAL PARKS						
NP11	A B B	NATIONAL PARK OF EASTERN MACEDONIA AND THRACE	0.52 0.40 3.40	153+400 112+500 120+000	153+900 112+900 123+400	100 % n/a 58 %

CODE	***TYPE/ ZONE***	***OFFICIAL NAME***	***LENGTH (km)***	***FROM KP***	***TO KP***	***Bundling with the Existing DESFA pipeline***
	B		0.87	152+500	153+400	100 %
	B		5.76	153+900	159+700	93 %
	C		1.21	111+300	112+500	n/a
	C		7.10	112+900	120+000	n/a
	C		5.66	123+400	129+000	78 %
	C		1.33	151+200	152+500	77 %
	C		15.57	159+700	175+300	37 %
	D		0.71	175+300	176+000	n/a
TOTAL LENGTH (km) THROUGH NP11			42.53			71 %
NP4	C	NATIONAL PARK OF LAKES KORONIA - VOLVI	10.31	312+400	322+700	100 %
	C		1.25	328+200	329+500	100 %
	C		11.70	332+400	344+100	100 %
TOTAL LENGTH (km) THROUGH NP4			23.26			100 %
TOTAL LENGTH (km) THROUGH NATIONAL PARKS			**65.79**			**81 %**
WILDLIFE REFUGE AREAS						
PERIOCHI KIRKIS (KIRKI AREA)			1.18	50+500	51+600	100 %
			0.69	54+000	54+700	100 %
		TOTAL LENGTH PERIOCHI KIRKIS (km)	1.87			100 %
HATOISIO			1.44	98+500	100+000	100 %
PERIOCHI KOMPSATOU (KOMPSATO'S AREA)			1.39	114+400	115+800	100 %
KOTZA ORMAN NESTOU			3.16	153+100	156+300	100 %
AGIOS TIMOTHEOS-KIOUPIA			4.15	187+300	191+500	n/a
PETROTO-FARAGGI-ALMYRA			3.00	225+200	228+200	100 %
FLAMOURIA - GRAMMATIKO			5.1	433+300	438+400	n/a
KOURI			8.00	471+000	479+000	n/a
TOTAL LENGTH (km) THROUGH WILDLIFE REFUGE AREAS			**28.10**			**39 %**

Source: ASPROFOS (2013)

6.4 Socioeconomic Environment

6.4.1 Overview

The aim of this Section is to provide an overview of socio-economic conditions in Greece, at a national and regional level, in addition to a description of the socioeconomic environment of the settlements situated close to the pipeline route and other Project facilities (compressor stations, block valve stations, campsites and lay down areas).

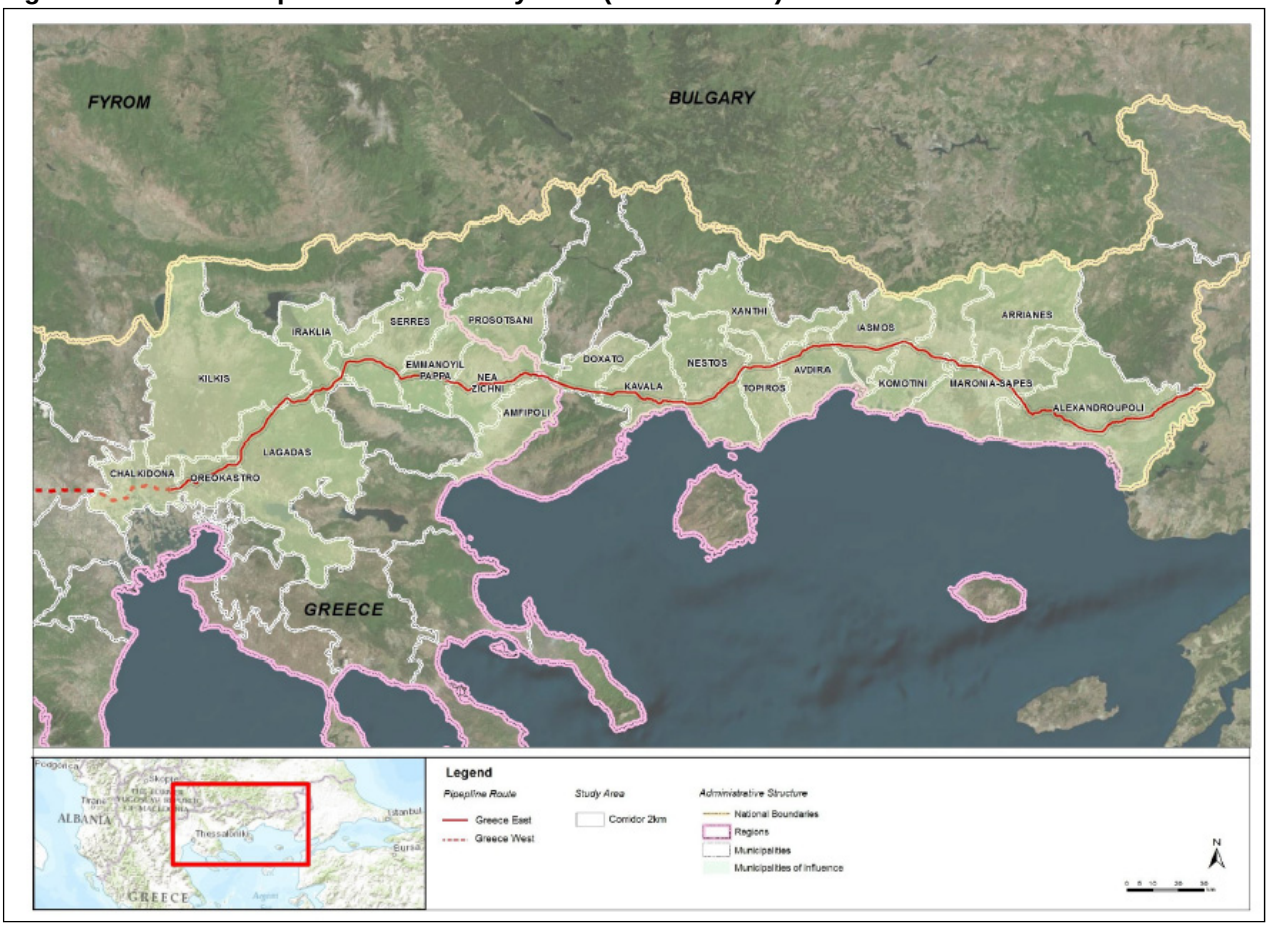
The information presented in this document at a national and regional level is based on material gathered from secondary sources, i.e., existing literature, publicly available documents and statistical information. Information on settlements close to the pipeline route has been obtained through secondary sources along with primary data collected during field visits to the Project area in September-October 2011 and January 2013. The fieldwork was conducted with the use of both qualitative and quantitative tools and included a household survey, key informant interviews and focus group meetings. Additional information on primary and secondary data sources can be found in *Annex 6.3 – Supporting Materials Socioeconomic Baseline*.

The socioeconomic study area runs the length of the 543 km pipeline corridor in northern Greece, from the Greek border with Turkey near Kipoi in East Macedonia – Thrace, to the border with Albania in West Macedonia, crossing a total of 31 municipalities and 98 settlements (see *Figure 6-93* and *Figure 6-94*). Where the pipeline corridor runs parallel to the existing DESFA pipeline network[42], the study area covers a 1km corridor (500 metres either side of the centre line), while at all other times a 2 km corridor (1 km either side of the centre line) was considered.

It should be noted that household survey data presented at a municipality level, is representative only of those settlements that lie within the pipeline corridor and not the municipality as a whole. A detailed description of the Project socioeconomic study area is provided in *Section 4* (Project Description).

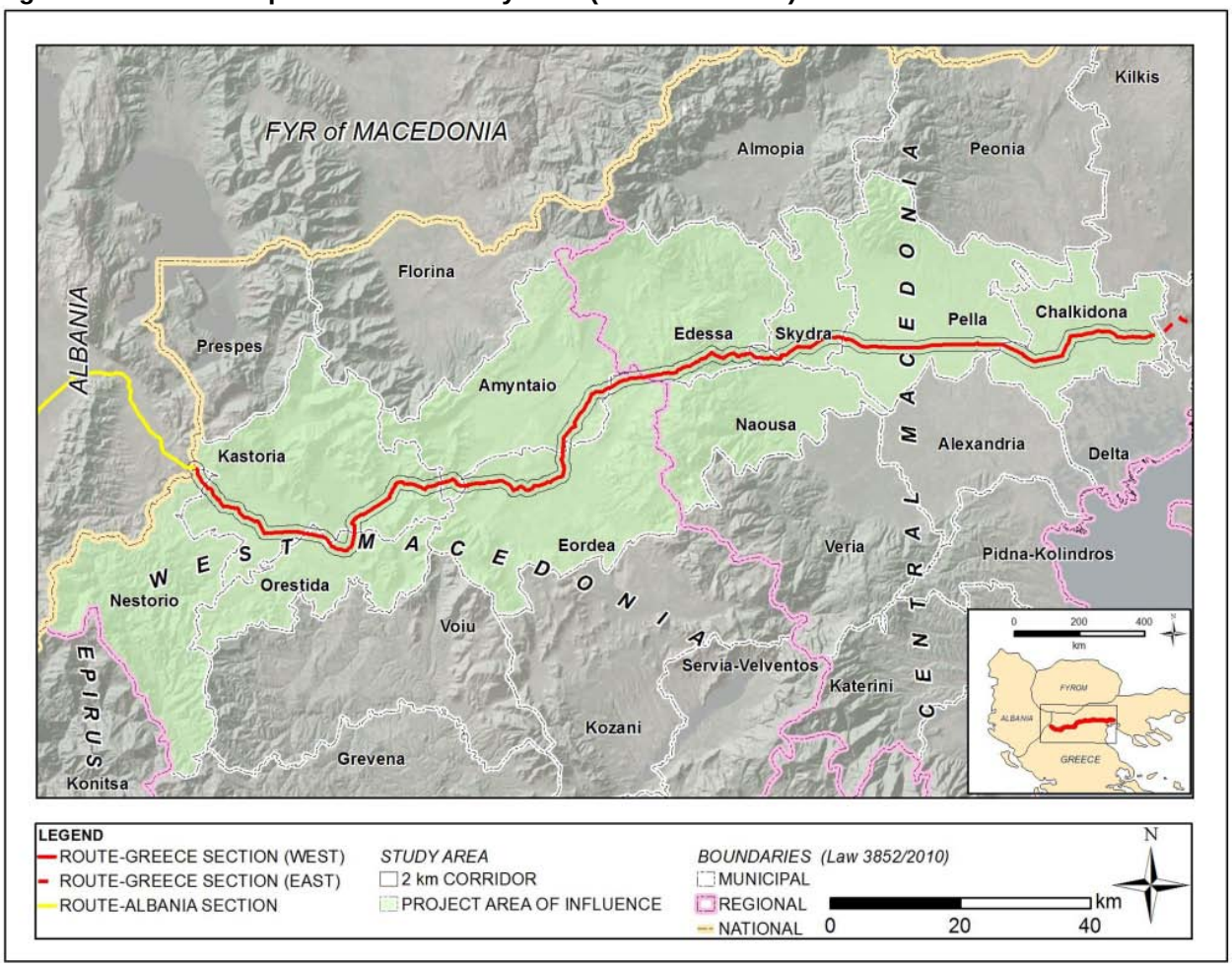
[42] The existing DESFA (former DEPA) gas pipeline crosses northern Greece from Kipoi to Thessaloniki.

Figure 6-93 Municipalities in the Study Area (KP0 – KP365)



Source: ASPROFOS (2013)

Figure 6-94 Municipalities in the Study Area (KP365 – KP543)



Source: ERM (2011)

The study area between the Greek border with Turkey near Kipoi (East Macedonia-Thrace) to Nea Mesimvria (Central Macedonia) is dominated by an agricultural landscape of varying undulation. In the east, near the Evros River, the area is characterised by flat agricultural land gradually becoming mixed pastures and forests towards Kavala. Between Kavala and Serres the landscape undergoes a transition to a mountainous-forested area (the Symvoli mountain range), before flattening into the irrigated agricultural land of Serres, until reaching the mountainous forests of Krousia. From this point onwards the land becomes agricultural once again, with undulating hills and natural grasslands north of Oreokastro.

The study area between Nea Mesimvria (Central Macedonia) to Greek-Albania borders in West Macedonia can be characterised as flat agricultural plain in the east (between Chalkidona and Skydra municipalities), transitioning into mountainous forested terrain (Mount Vermio) and then

descending again into the Eordea Plain, before becoming hillier from the west of Kastoria to the Albanian border.

Land use and economic activity in the socioeconomic study area is heavily agricultural, but also changes along with the terrain and presence of population centres along the route.

Information is presented in this section at a settlement and municipality level, with reference to other levels (i.e. regional and national) where relevant. This section is supported by a series of socioeconomic baseline maps, which are presented in *Annexes 4.4*, *4.5* and *4.6* and referred to throughout this section.

This report presents a detailed description of the socioeconomic conditions within the study area in the following sections:

- Historical and Political Overview;
- Demographics and Settlements;
- Economy, Employment and Income;
- Land Tenure and Use;
- Infrastructure and Public Services;
- Traffic and Transport;
- Education and Skills;
- Public Health;
- Safety and Security; and
- Vulnerability.

6.4.2 Historical and Political Overview

6.4.2.1 Historical Context

The early history of Greece is described in the Cultural Heritage Section of this report (see *Section 6.5, Table 6-129*). In classical times, Macedonia was part of the Greek state and maintained a historical role as the ‘fence’ of southern Greece, fending off invasions from the

northern Balkans, Alexander the Great and three wars against the Romans[43]. Thrace was also part of Macedonia, conquered by Philip 2nd, King of Macedonia. Later, in the Roman and Byzantine era, Thrace and Macedonia, with its capital city Thessaloniki, grew in importance. Emperors Constantine and Theodosios used Thessaloniki as their base for their military campaigns, constructed a harbour and strengthened the cities fortification. Thrace also faced unprecedented growth, both in population and in commerce, due to its close proximity to Constantinople, the capital of the Byzantine Empire.

The 6th and 7th centuries AD were difficult for the area (and the Balkans in general), as a result of frequent invasions from Avaro-Slavic tribes. Many of the Macedonian cities were conquered and destroyed, although Thessaloniki managed to defend itself until 904, when Saracen pirates captured the city. In the following years, Macedonia was the theatre of continued battles and changed hands a number of times between Byzantines, Normans, Slavs, Franks and Turks. The conquering of Thessaloniki by the Turks in 1430 started the long-lasting Turkish occupation and the area saw a large increase in the Turkish and Muslim population.

Under Turkish occupation, Macedonia and Thrace were among the central provinces of the Ottoman state, and one of the first areas of the Greek peninsula to be incorporated into the Ottoman Empire. Subsequently, the control of its central authorities was far more effective than in other provinces of the Greek peninsula. The presence of a significant Muslim population throughout this period, as well as strong military forces, prevented the growth of any form of revolutionary movement, until the beginning of the 18th century[44].

In 1878, as a result of the Treaty of St. Stefanos, part of Thrace was detached from the Ottoman Empire and awarded to “Great Bulgaria”. In the same year the Congress of Berlin resulted in the restoration of Eastern Rumelia (part of Thrace) to the Turks, as a semi-independent state, but by 1885 Eastern Rumelia was willingly united with Bulgaria. It was not until 1919 and the Treaty of Neuilly-sur-Seine that Bulgaria ceded Western Thrace to the Triple Entente (the alliance between France, Britain and Russia), who, in the same year, awarded it to Greece at the San Remo conference[45]. Macedonia was annexed to the Greek state earlier with the Treaty of Bucharest (August 10, 1912), which was the result of the Balkan Wars (first against the Ottoman Empire and then against Bulgaria).

[43] Sverkos, I. (2007). *Macedonia in the Classical and Hellenistic Periods*. Thessaloniki.
[44] Kotzageorgis, P. (2007). *Ottoman Macedonia,* Thessaloniki.
[45] Soilentakis, N. (1996). *History of Thracian Hellenism*. Pitsilos, Athens.

After the Greek - Turkish War (1919-1922) and the Asia Minor Catastrophe, Greeks and Turks signed the Treaty of Lausanne (1923), which resulted in a population exchange between the two countries. The agreement meant the simultaneous expulsion of Christians from Turkey to Greece and of Muslims from Greece to Turkey. The Greek state settled the greater part of the refugees in Macedonia and Thrace, awarding them with ownership titles as compensation for the land they had left in Turkey. Among the refugees were many Pontic speaking[46] populations, who moved from the Black Sea to Greece. The legacy of these population exchanges is still in evidence in Macedonia, with many older residents tracing their roots to that period and continuing to speak Pontic Greek as a second language.

During World War II, Greece was occupied by the Germans, along with their allies the Italians and the Bulgarians. At the end of WWII, following the withdrawal of the occupying forces, Greece entered a period of civil war, which lasted until 1949. The civil war was fought between the communist-controlled “National Liberation Front–National Popular Liberation Army” and the “Greek Democratic National Army”. The communists admitted defeat in 1949 and a period of economic hardship, political instability and polarisation followed cumulating in a military coup in 1967. The military regime transitioned in 1974[47] and modern Greece was formed as a democratic republic based on the constitution of 1975 and became a member of the EU in 1981[48].

6.4.2.2 Modern Political Context

Since the end of the military dictatorship in July 1974, the political system of Greece has been a Presidential Parliamentary Democracy. Until 2012 Greece was characterised by a two-party system dominated by the New Democracy (ND) and the Panhellenic Socialist Movement (PASOK) political parties. However, in the 2012 elections, no single party won a majority of seats in the 300-member parliament and the previously dominant parties lost votes to other smaller parties. ND won 30% percent of the vote (129 seats), a coalition of radical left wing parties called SYRIZA won 27% of the vote (71 seats) and PASOK 12% of the vote (33 seats). Seven parties in total entered the parliament, namely, ND, SYRIZA, PASOK, ANEL, GD, DA and KKE (*Box 6-1*).

[46] Pontic Greek is a form of the Greek language, originally spoken on the shores of the Black Sea, the Pontus.
[47] Encyclopaedia Britannica: http://www.britannica.com/
[48] http://europa.eu/abc/european_countries/eu_members/greece/index_en.htm

Box 6-1 Political Parties that entered the Parliament after the 2012 elections in Greece

ND - New Democracy, a centre-right political party.

SYRIZA - Coalition of Radical Left, a left party.

PASOK - Panhellenic Socialist Movement, a centre-left political party.

ANEL - Independent Greeks, a right-wing party representing national conservatism.

GD -Golden Dawn, representing far-right politics.

DA – Democratic Left, a democratic socialist party.

KKE – Communist Party of Greece.

Collated by ASPROFOS (2013)

In late 2009, the Greek economy faced a severe crisis, with the deficit rising to 15.4% of gross domestic product (GDP[49]), which led to the European Union member States and the International Monetary Fund (IMF) placing the country under surveillance, demanding financial reforms and acceptance of technical assistance. Due to the lack of international confidence in Greece's ability to pay its debt, the EU and the IMF agreed to a bailout package, totalling €110 billion.

In 2012, European officials helped Greece negotiate several landmark debt restructuring deals with the vast majority of its private sector lenders. The European Commission, the European Central Bank and the IMF (the so-called "Troika"), begin releasing funds on the condition that the government implement austerity measures to reduce public spending. The austerity measures centre on a reduction in government spending, changes to the tax system and amendment of legislation. The implementation of these measures is monitored and evaluated by the "Troica".

6.4.2.3 Local Administrative Structure

On June 7, 2010, Act 3852/10 was implemented, which is the legal framework for the "Kallikratis" Programme and has resulted in a large scale restructuring of Greece's local administrative system. Information on Act 3852/10 is provided in brief in *Box 6-2*.

[49] Gross domestic product (GDP) refers to the market value of all officially recognized final goods and services produced within a country in a given period.

Box 6-2 Kallikratis Programme

The main aim of Kallikratis Programme is to provide the country with a more functional, decentralized administrative structure. This structure consists of self-administrating regions with important responsibilities and efficient municipalities armed with new powers and resources. The main concepts of Kallikratis Programme are:

- the organisation of self-government in two functional units, the municipality and the region, which are responsible for managing local affairs and undertaking State functions and
- the reorganisation of decentralised administration, which is broader in scale in order to increase effectiveness and reduce public spending

The Kallikratis Programme is compliant with the Greek constitution as well as the EU Lisbon Treaty.

Source: Ministry of Interior, Decentralization and SET-government

Since the Kallikratis Programme of reform entered into effect (01 January 2011), Greece has consisted of 7 Decentralised Administrations[50], 13 Regions[51] and 325 Municipalities. The Prefectures of the old system (54 in total) have largely been retained as sub-units of the regions and they are referred to as “Regional Entities”. There is also one autonomous territory with special status, The Community of Mount Athos Monasteries (Greek: Agio Oros, or "Holy Mountain"), which borders the region of Central Macedonia.

Each region is formed of a number of municipalities, which are subsequently divided into municipal or local communities, depending on population size. Since the Kallikratis reform, many of the old municipalities in the study area have been merged into new, larger municipalities (see maps in *Annex 4.4 – Administrative Structures*). Municipal and local community representatives are elected every five years and the municipality authority has administrative powers over the municipality as a whole and all the local communities within it. Civil servants manage all decentralized state services, such as public order, education, health care, employment, justice, urban plans. The local administrative structure of Greece, following Kallikratis reform, is presented in *Box 6-3.*

[50] These are: Attica, Macedonia and Thrace, Epirus and Western Macedonia, Thessaly and Continental Greece, Peloponnese-Western Greece and the Ionian Islands, Aegean, Crete.
[51] Attica, East Macedonia and Thrace, Central Macedonia, Epirus, West Macedonia, Thessaly, Central Greece, Peloponnese, West Greece, Ionian Islands, North Aegean, Southern Aegean, Crete.

Box 6-3 Local Administrative Structure of Greece, following Kallikratis Reform

Decentralised administrations

∟ **Regions** (2nd level of self-government), consisting of Regional Entities (the old Prefectures)

∟ **Municipalities** (1st level of self-government), consisting of:

- **Municipal Communities** (> 2000 inhabitants)*
- **Local Communities** (< 2000 inhabitants)

*With the exception of the islands where a 1.000 inhabitants limit is set for Municipal Communities.

Collated by ERM (2011) and ASPROFOS (2013)

The transition to this new administrative structure has a number of implications for the secondary data presented in this report. Many of the old municipalities in the study area have been merged into new, larger municipalities, therefore municipality level data prior to 2011 refers to the old administrative borders. A summary of the relationship between the old and new municipalities is included in *Table 6-106* .

Table 6-106 Old and New Administrative Structures in the Study Area

Approximate Chainage (KP)	*Old municipalities ('Kapodistrian')*	*New municipalities ('Kallikratis' Project)*	*Settlements within study area'*
0-7	Tychero	Soufli	No settlement
0-66	Alexandroupoli Traianoupoli Ferron	Alexandroupoli	Peplos Kavissos Pefka Aetochori Anthia Agnantia Amfitriti
80-81	Kechros	Arrianon	No settlement
66-91	Maronia Sapes	Maronia - Sapes	Chamilo Pamforo Amaranta
87-105	Komotini Egiros Neo Sidirochorio	Komotini	Fylakas Kosmio Itea Mesochori Scholi Astynomias Meleti
103-126	Iasmos Sostos Amaxades	Iasmos	Galini Koptero Amaxades
126-144	Vistonida Seleros	Avdira	Ano Polysitos Vafeika Feloni Diomidia Tektonas Palaio Katramio Magiko
144-145	Xanthi	Xanthi	No settlement

Approximate Chainage (KP)	***Old municipalities ('Kapodistrian')***	***New municipalities ('Kallikratis' Project)***	***Settlements within study area'***
145-154	Topiros	Topiros	Vaniano Pimni Thalassia
154-176	Chrysoupoli	Nestos	Krini Neos Xerias Grabouna Pontolivado
176-199	Kavala Philippoi	Kavala	Nea Karvali Chalkero Amygdaleonas Neos Zygos (Prosfyges) Polystylo Krinides
219-221	Kalampaki Doxato	Doxato	Kalamonas Agia Paraskevi
229-231	Sitagroi	Prosotsani	No settlement
222-234	Kormista Proti	Amfipoli	Symvoli
234-261	Nea Zichni Alistrati	Nea Zichni	Stathmos Lefkothea Nea Zichni Tholos Gazoros
261-277	Emmanouil Pappa Strymona	Emmanouil Pappa	Pentapoli Neochori
277-297	Serres Kato Mitrousi Lefkonas	Serres	Krinos Mitrousi Monoklisia Provatas
297-309	Strymoniko	Iraklia	Livadochori Kalokastro Kefalochori
317-323	Krousson	Kilkis	No settelement
309-342	Lachana Assiros	Lagada	Evaggelistria Lachanas Assiros
342-363	Mygdonia Kallithea	Oreokastro	Drymos Melissochori Pentalofos
363 - 390	Agios Athanasios Koufalia	Chalkidona	Nea Mesimvria Aghialos Gefira Valtochorion Parthenion Mikron Monastirion
390 - 415	GIannitsa Kirou Pella Kria Vrisi Megas Alexandros	Pella	Agios Loukas Liparon

Approximate Chainage (KP)	***Old municipalities ('Kapodistrian')***	***New municipalities ('Kallikratis' Project)***	***Settlements within study area'***
415 - 426	Meniidos Skydras	Skydra	Kalivia Aspron Rizon Loutrochorion Plevroma Petrea
426 - 430	Anthemion Eirinoupolis Naousas	Naousa	Polla Nera
430 - 450	Vegoritida Edessa	Edessa	Agia Fotini Ano Grammatiko Kato Grammatiko
450 - 455 and 469 - 490	Ptolemaida Vermio Mouriki Agia Paraskevi	Eordea	Purgoi Pentavrussos Perdikkas Galateia Droseron Foufas
455 - 469 and 490 - 494	Aetos Amyntaio Filotas	Amyntaio	Maniaki Antigonos Varikon
494 - 513 and 523 - 543	Kastoria Agia Triada Mesopotamia Korestion Agion Anargiron Makednon Bitsi Kleisoura	Kastoria	Kleisoura Lithia Verga Agia Paraskevi (monastery) Krepeni Dispilio Korissos Chiliodentro Poreia Tsakoni Mesopotamia Agia Kuriaki Oinoi
513 - 523	Orestida Ionos Dragoumi	Orestida	Militsa Ampelokipoi
543 - 546	Nestorio Akriton	Nestorio	-

Collated by ERM (2011) and ASPROFOS (2013)

In addition to the boundary changes, the abolishment of the prefectures as a level of self-government during Kallikratis reform has meant that the role of municipalities has grown in significance. An overview of the current municipality level functions is presented in *Box 6-4.*

Box 6-4 Functions of Municipalities after Kallikratis Programme

- ***Development:*** Research, planning and implementation of developmental plans, concerning local natural and human resources and infrastructures.
- ***Environment:*** Protection of natural, architectural and cultural environment in the framework of national and European policies, rational use of resources, waste management, fire protection, building permits, control of topographical plans and land uses.
- ***Quality of Life and Urban Transportation:*** Office permits, public health and consumer protection, committees between consumers and merchants, public transportation plans and works, traffic management.
- ***Employment:*** Licensing of certain categories of professions, implementation or participation in actions plans aimed at the promotion of employment, establishment of vocational guidance and training centres counselling services for unemployed persons, programs of vocational training.
- ***Social Protection and Solidarity:*** Provisions for vulnerable social groups and individuals (e.g., establishment and operation of nurseries, care centres, centres of entertainment for the elderly, change of use in buildings for the benefit of homeless etc.), control of the handicapped and poverty benefits, control on programs of public health.
- ***Education, Culture and Sports:*** Control on constructing school buildings, libraries, museums and stadiums, planning on scholarships, planning for the protection of local culture and the promotion of life-long learning.
- ***Rural, Livestock-Farming and Fishery Development:*** Research on and systematic monitoring / organization of rural development, with the authority to permit the use of land for industrial purposes and the ability to produce studies for the environmental consequences, construction of rural roads and all needed works for rural, livestock and fishery development.
- ***Civil Protection:*** Planning and implementation of actions for the prevention and dealing with local crises and disastrous events.

Sources: Act 3852/2010 ("Kallikratis"), Article 94, combined to Article 75 Act 3463/2006. Ministry of Interior, "Separation of Powers in Greece". Available at: http://www.ypes.gr/UserFiles/f0ff9297-f516-40ff-a70e-eca84e2ec9b9/DIVISION_OF_POWERS_GREECE_10072012FINAL.pdf

6.4.2.4 Local Decision Making

Municipal communities (2,000 – 10,000 inhabitants) are represented by a 5-member council, while local communities (300 - 2000 inhabitants) are governed by a council comprising of 3 members. In local communities with populations under 300 inhabitants, only one representative is elected. The local council elects the Head (or Chairman) of the local community, who is responsible for local representation at monthly municipality level meetings (municipal councils)[52].

Box 6-5 presents information on the functions of the head of local community and the local council.

[52] Katsoulis, D. (2010). Intra-municipal Decentralization. EETAA.

Box 6-5 Functions of the head of local community and local council

Head of local community jurisdiction

- Maintains the local community internal road network and rural roads and supervises maintenance works.
- Responsibility for the cleaning of public places in cooperation with competent municipal authorities.
- Responsibility for restoring damages in water supply and sanitation network and -in exceptional cases- for delegating rehabilitation work.
- Ensures proper operation of street lighting network in cooperation with the responsible municipal service.
- Ensures maintenance and safety of playgrounds in cooperation with the competent municipal authority.
- Ensures proper operation, maintenance and good order of the cemetery of the local community
- Responsible for the local fire fighting team and for the preparation of fire and natural disaster plan in cooperation with competent municipal authorities.
- Responsible for the protection of municipal property within the limits of the local community.
- Recommends to the local council matters of its competence and implements the decisions of local council.
- Effect payments from standing deposit provided by the municipal budget.

Local council jurisdiction

- Consultation with the municipal council on issues of protection and optimal use of the municipal property (defines the number of municipal services that need to operate in the area of its jurisdiction, manages urban development and municipal property in the area of its jurisdiction, manages communal areas, pastures and forests of the local community).
- Consultation with the municipal council on social care measures for financially weak inhabitants, large families and other vulnerable persons.
- Submits propositions to the Committee of Life Quality on issues relevant with the function of communal spaces (such as parking locations and outdoors trading activities).

Source: Circular 49, 29-12-2010, Operational Plan of Municipal and Local Communities.

Whilst local councils represent the official decision-making body at the local level, the degree to which they are actively involved in addressing the needs of the community and interacting with municipal officials varies quite widely on a settlement to settlement basis.

6.4.2.5 National Development Plans

In order to address spatial problems, such as de-industrialization, uneven development, destruction of the countryside as a result of unplanned construction and increased air pollution the National Ministerial Council approved the Greek National Strategy for Sustainable Development (NSSD) in June 2002. This document was prepared by the Hellenic Ministry for the Environment, Physical Planning and Public Works (MEPPPW), in addition to the National Centre

for the Environment and Sustainable Development (NCESD). The 2002 NSSD was aimed at "the achievement of economic development, while safeguarding social cohesion and environmental quality"[53].

The NSSD includes the following actions:

- climate change abatement;
- reduction of air pollutants;
- reduction and rational management of solid waste;
- water resources management;
- combating desertification;
- protection of biodiversity and natural ecosystems; and
- sustainable management of forests.

In 2008, the NSSD was revised, with the participation of various social groups and Ministries in the context of a wide public consultation. The revised NSSD encompasses the priorities of the Renewed EU Strategy for SD (2006), plus four additional priorities of national interest for Greece, i.e., Culture, Tourism, Agriculture and Physical Planning.

The National Plan for Sustainable Development (JMD 6876/4871/2008 - Gov. Gaz.128/A/03.07.08), is based on a thorough review of the parameters that promote the protection and improvement of the natural, cultural and socio-economic environment. Thispoints out the need for extending the natural gas network infrastructure, as a way of contributing to the strategic enhancement of Greece in Southeastern Europe. More specifically, this includes:

- *Art. 6* - Spatial conformation of strategic importance for infrastructure, transportation, communication and energy networks –
- *Par. B.1(d):* Enhancement of the international role of Greece, as a centre for power, natural gas, oil transfer; and
- *Par. B.2(c):* Integration of High Pressure Natural Gas system, according to the existing planning (main connection with Italy and Turkey and branches to FYROM, Albania etc) and with the addition of new infrastructure.

[53] U.N. "Information on National Sustainable Development Strategy (NSDS) or its equivalent". www.un.org/esa/agenda21/natlinfo/countr/greece/nsds.pdf

- There are no specific references to the TAP Project in the Regional Plans, but there are articles referring to energy connections and natural gas infrastructure:
- *East Macedonia and Thrace Regional Plan, JMD 29310/2003 (Gov. Gaz. 1471/B/09.10.2003):* Reference is made to the region's potential role in energy transportation and natural gas as a basic development infrastructure for the whole region;
- *Central Macedonia Regional Plan, JMD 674/2004 (Gov. Gaz. 218/B/06.02.04):* Reference to Natural Gas as a basic development infrastructure for the Thessaloniki area;
- *Western Macedonia Regional Plan , JMD 26295/2003 (Gov. Gaz. 1472/B/09.10.03); and*
- *Art. 3, par. 3.7.1 (Energy)*: Directions for interconnection to international energy networks.

In addition to the NSSD, in July 2010 the Greek government implemented a policy document titled "Programme of Developmental Interventions for the Real Economy", (Ministry of Environment, Energy and Climate Change -MEECC), setting out the developmental plans for the period 2010 – 2015. The main pillars of the programme are described as follows:

- Addressing climate change by the transition to a low carbon competitive economy.
- Sustainable development and protection of natural resources.
- Improving the quality of life with respect to the environment.
- Strengthening of the mechanisms and institutions of environmental governance.

The extension of natural gas networks is characterized as a "fundamental choice of the energy policy applied by the MEECC in the context of the national targets"[54].

However, it must be noted that due to the relatively short period during which the programme has been running - and given the economic situation in Greece- its implementation is challenging and its effectiveness has not yet been assessed.

6.4.2.6 Regional and Local Development Plans

Each region is responsible for designing development plans, which are funded by central government bodies or specific programmes like the National Strategic Reference Framework

[54] MEECC (2010). *Programme of Developmental Interventions for the Real Economy,* p. 13. Available at : http://www.ypeka.gr/LinkClick.aspx?fileticket=tReIPNhjmk4%3D&tabid=367

(NSRF). The NSRF contains a series of Sector Operational Programmes, which are used by regions throughout Greece as guidance in the development of Regional Operation Programmes (ROP) with a focus on the following areas:

- Environment - sustainable development;
- accessibility improvement;
- competitiveness and entrepreneurship;
- digital convergence;
- human resource development;
- education and lifelong learning;
- public administration reform;
- technical support for implementation; and
- national contingency reserve.

The ROP of Macedonia–Thrace[55] covers three regions in northern Greece: East Macedonia–Thrace (GR11), Central Macedonia (GR12) and West Macedonia (GR13). The ROP for the period 2007- 2013 (budget of €4.2 billion) is structured based on three main objectives (or priority axes), which are defined as follows: (a) increase accessibility to infrastructure and services, (b) facilitation of digital convergence and entrepreneurship and (c) promotion of sustainable development and quality of life. A fourth set of priorities contains the provision of technical assistance for implementation of the first three thematic priorities.

At a local level, each municipality is responsible for a development plan, which is to be designed and agreed upon with heads of the local councils. General urban plans designate land uses within the municipality, including land uses, protected areas, areas of building control and restriction and areas of current urban development or future expansion.

Under Act 2508/97, all municipalities are required to develop a General Urban Plan designating land uses in the area of the municipality. However, not all of the municipalities have completed their plans since the Kallikratis administrative reform came into effect and many existing plans are now outdated. A list of the 60 available Urban Development plans within the socioeconomic study area, including any development plans in or near the pipeline route, is presented in *Table* **6-107**. According to available development plans, the majority of settlements have some plans for

[55] http://www.makedonia-thrace.gr/en/Pages/Default.aspx

expantion of residential areas, infrastructure and in one area there are plans to develop a military zone in the vicinity of the pipeline.

In addition to the above, local level spatial planning includes Urban Control Zones, which aim to provide building and land use controls in off-plan areas outside the village limits, and to address environmental degradation and uncontrolled development.

With the exception of specifically protected areas and urban control zones, Greek zoning laws enable any landowner with a plot of land > 4,000 m^2 to build a structure (residential or industrial) on that site.

Table 6-107 Designated Land Uses (General Urban Plans) along the Pipeline Corridor

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
Alexandroupoli	Ferron		Approved	Boundaries of Peplos settlement	005+365 - 006+540	Approximately 650 m south of the centreline
		Gov. Gaz no. 1043/D/31-10-1986 regarding the determination of Agnantia settlement boundaries and building restrictions	Approved	Boundaries of Kavissos settlement	015+400 - 016+150	Approximately 250 m south of the centre line
	Alexandroupoli	Gov. Gaz no. 1043/D/31-10-1986 regarding the determination of Agnantia settlement boundaries and building restrictions	Approved	Boundaries of Pylaia settlement	019+930 - 021+780	Approximately 500 m to 1,000 m north of the centreline
		Gov. Gaz no. 1043/D/31-10-1986 regarding the determination of Agnantia settlement boundaries and building restrictions	Approved	Boundaries of Agnantia settlement	035+060 - 035+513	The centreline passes at a distance of approximately 450 m through the boundaries of Agnantia settlement
		Gov. Gaz no. 1043/D/31-10-1986 regarding the determination of Agnantia settlement boundaries and building restrictions	Approved	Boundaries of Amfitriti settlement	040+20 - 040+670	Approximately 300 m north of the centreline
		The project is under tenders call	Preliminary study	Waste treatment plant	042+490 - 045+485	Approximately 40 m to 1,000 m north of the centreline
	Traianoupoli	Gov. Gaz no. 532/D/11-06-1987 regarding the determination of Pefka settlement boundaries and building restrictions	Approved	Boundaries of Pefka settlement	027+740 -028+385	Approximately 30 m to 515 m north of the centreline

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
		Gov. Gaz no. 1043/D/31-10-1986 regarding the determination of Agnantia settlement boundaries and building restrictions	Approved	Boundaries of Aetochori settlement	031+385 - 032+15	Approximately 235 m north of the centreline
Maronia - Sapes	Sapes	The area has been designated for the wastewater treatment plant. The study is preliminary and is in the contractor selection stage. The project will be studied and built by the contractor	Approved	Study of the wastewater treatment plants of Sapes settlement	071+00 - 071+125	The centreline passes at a distance of approximately 125 m through the area of the wastewater treatment plants
Komotini	Komotini	Gov. Gaz no. 1366/D/31-12-1992 regarding the determination of Fylakas settlement boundaries and building restrictions	Approved	Boundaries of Fylakas settlement	086+865 - 087+560	Approximately 710 m south - west of the centreline
			Under approval	Local Town Building Plan for education of people with disabilities	094+585 - 094+805	The centreline passes at a distance of approximately 220 m through the Local Town Building Plan for education of people with disabilities
		Gov. Gaz no. 855/D/18-09-1986 regarding the determination of Mesochori settlement boundaries and building restrictions & Gov. Gaz no. 1022/D/29-09-1994 regarding the approval of the town plan of Mesochori settlement	Approved	Boundaries of Mesochori settlement	099+85 - 099+675	Approximately 170 m south of the centreline
		Future project	Approved study	Future hospital of Komotini	103+210 - 103+560	Approximately 170 m south of the centreline

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Egiros	Gov. Gaz no. 276/D/03-05-1995 regarding the determination of Meleti settlement boundaries and building restrictions	Approved study	Boundaries of Meleti settlement	104+490 - 105+590	Approximately 740 m south of the centreline
Avdira	Vistonida	Gov. Gaz no. 143/D/26-02-1987 regarding the determination of Polysitos settlement boundaries and building restrictions	Approved	Boundaries of Polysitos settlement	128+485 - 129+215	Approximately 365 m south of the centreline
		Decision no. 3332/26-11-1987 Town Planning Department of Xanthi Prefecture	Approved	Boundaries of Vafeika settlement	135+710 - 136+315	Approximately 150 m south of the centreline
		Decision no. 1832/6-5-1986 Town Planning Department of Xanthi Prefecture regarding the determination of Diomidia settlement boundaries and building restrictions & Gov. Gaz no. 605/D/30-10-1990 regarding the approval of the town plan of Diomidia settlement	Approved	Boundaries of Diomidia settlement	139+420- 140+515	Approximately 580 m to 930 m north of the centreline
		Decision no 1832/6-5-1986 Town Planning Department of Xanthi Prefecture regarding the determination of Diomidia settlement boundaries and building restrictions	Approved	Boundaries of Tekton settlement	139+515 - 139+825	Approximately 383 m north of the centreline
		Gov Gaz. No. 146/D/26-02-1987 regarding the determination of Magiko settlement boundaries and building restrictions	Approved	Boundaries of Magiko settlement	141+85 - 141+495	Approximately 505 m north of the centreline

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
Topiros	Topiros	Decision no. 3477/09-09-1986 Town Planning Department of Xanthi Prefecture regarding the determination of Thalassia settlement boundaries and building restrictions	Approved	Boundaries of Thalassia settlement	151+340 - 152+285	Approximately 45 m to 250 m north of the centreline
Kavala	Kavala	General Urban Plan of Kavala has already been approved and the official publication in the Government Gazette is in progress	Approved	Boundaries of Nea Karvali settlement	177+670 - 178+255	Approximately 400 m south of the centreline
		General Urban Plan of Kavala has already been approved and the official publication in the Government Gazette is in progress	Approved	Boundaries of Nea Karvali settlement by decision of Head of the Regional Entity	178+255 - 180+000	General Urban Plan of Kavala which has already been approved and Official publication in Government Gazette is in progress. Approximately 470 m distance south of the baseline's centreline
		Preliminary study	Future	Future landfill	178+830 - 179+025	Approximately 500 m north of the centreline
		General Urban Plan of Kavala has already been approved and the official publication in the Government Gazette is in progress	Approved	Boundaries of Chalkero settlement	181+755 - 182+215	Approximately 100 m north of the centreline
		General Urban Plan of Kavala has already been approved and the official publication in the Government Gazette is in progress	Approved	Boundaries of Chalkero settlement	182+220 - 182+500	The centreline passes for a distance of approximately 280 m through the boundaries of Chalkero settlement

Municipality Kallikratis ("new")	***Municipality Kapodistrias ("old")***	***General Urban Plan under Law 2508/97 or House Act***	***Approval Status***	***Designated Land Use crossed by the pipeline***	***Approximate pipeline chainage (KP)***	***Comments***
		General Urban Plan of Kavala has already been approved and the official publication in the Government Gazette is in progress	Approved	Boundaries of Chalkero settlement	182+500 - 183+0	Approximately 150 m north of the centreline
	Philippoi	Gov Gaz. No. 121/AAP/11-04-2013 regarding the determination of Magiko settlement boundaries and building restrictions	Approved	Boundaries of Krinides	198+440 – 200+890	Approximately 1,157 m north of the centreline
		Gov Gaz. No. 747/D'/1986 regarding the determination of Magiko settlement boundaries and building restrictions	Approved	Boundaries of Polistilo settlement	198+723 – 199+232	Approximately 1,680 m south of the centreline
Doxato	Kalampaki	Gov Gaz. No. 1379/D/31-12-1986 regarding the determination of Magiko settlement boundaries and building restrictions	Approved	Boundaries of Kalamonas settlement	207+230 – 208+288	Approximately 800 m south of the centreline
		Gov Gaz. No. 500/D/02-06-1987 regarding the determination of Magiko settlement boundaries and building restrictions	Approved	Boundaries of Agia Paraskevi settlement	212+435 – 213+146	Approximately 855 m south of the centreline
Nea Zichni	Alistrati	Gov Gaz. no. 349/D/30-04-1987 regarding the determination of Lefkothea settlement boundaries and building restrictions	Approved	Boundaries of Lefkothea settlement	234+943 - 235+050	Approximately 367 m north of the centreline
		Gov Gaz. no. 349/D/30-04-1987 regarding the determination of Lefkothea settlement boundaries and building restrictions	Approved	Boundaries of Lefkothea settlement	234+370 - 235+160	Approximately 208 m north of the centreine

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Nea Zichni	Gov Gaz. no. 885/D/15-09-1987 regarding the determination of Gazoros settlement boundaries and building restrictions & Gov. Gaz. no. 933/D/19-12-1991, regarding the approval of the town planning study of Messorrachi settlement	Approved	Boundaries of Messorachi settlement	239+472 - 240+327	Approximately 785 m south of the centreline
		Gov Gaz. no. 487/D/29-05-1987 regarding the approval of the town planning of Nea Zichni settlement & Gov. Gaz. no.593/D/3-08-1999, regarding the approval of the town planning study expansion of Nea Zichni settlement boundaries	Approved	Boundaries of Nea Zichni settlement	242+00 - 243+00	Approximately 680 m north of the centreline
		Gov Gaz. no. 885/D/15-09-1987 regarding the determination of Tholos settlement boundaries & Gov. Gaz. no. 127/D/14-02-1994, regarding the expansion of Tholos settlement boundaries	Approved	Boundaries of Tholos settlement	246+380 - 247+375	Approximately 30 m south of the centreline
		Gov Gaz. no. 885/D/15-09-1987 regarding the determination of Gazoros settlement boundaries & Gov. Gaz. no. 386/D/24-06-1991, regarding the expansion of Gazoros settlement boundaries	Approved	Boundaries of Gazoros settlement	248+591 - 249+645	Approximately 30 m north of the centereine

Municipality Kallikratis ("new")	***Municipality Kapodistrias ("old")***	***General Urban Plan under Law 2508/97 or House Act***	***Approval Status***	***Designated Land Use crossed by the pipeline***	***Approximate pipeline chainage (KP)***	***Comments***
Emmanouil Pappa	Emmanouil Pappa	Gov Gaz. no. 460/D/04-07-1988 regarding the determination of Pentapoli settlement boundaries and building restrictions	Approved	Boundaries of Penatapoli settlement	265+940 - 267+0	Approximately 1,060 m north of the centreline
	Strymona	Gov Gaz. no. 1258/D/31-12-1987 regarding the determination of Pentapoli settlement boundaries and building restrictions	Approved	Boundaries of Neochori settlement	275+580- 275+650	Approximately 970 m north of the centerline
Lagada	Assiros	Gov Gaz. no. 627/AAP/31-12-2012 regarding the approval of Assiros municipality SXOOAP	Approved	Boundaries of Assiros settlement	339+510 - 340+930	Approximately 760 m east of the centreline
Oreokastro	Mygdonia	Gov. Gaz. No. 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Agricultural land area of secondary priority	340+110 - 346+740	The centreline passes for a distance of approximately 6,632 m through the agricultural land area of secondary priority
		Gov. Gaz. No. 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Military installations	343+0 - 344+290	Approximately 235 m north of the centreline
		Gov. Gaz. No. 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Boundaries of Drymos settlement	346+580 - 346+780	Approximately 1,120 m north of the centreline
		Gov. Gaz. No. 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Boundaries of Drymos settlement	348+00 - 350+160	Approximately 1,360 m north of the centreline

Municipality Kallikratis ("new")	***Municipality Kapodistrias ("old")***	***General Urban Plan under Law 2508/97 or House Act***	***Approval Status***	***Designated Land Use crossed by the pipeline***	***Approximate pipeline chainage (KP)***	***Comments***
		Gov. Gaz. no 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Agricultural land area of secondary priority and urban services	346+740 - 349+865	The centreline passes for a distance of approximately 3,125 m through agricultural land area of secondary priority and urban services
		Gov. Gaz. no 302/AAP/27-07-2010 regarding the approval of the general town plan of Nea Mygdonia municipality	Approved	Boundaries of archaeological area	346+780 - 348+160	Approximately 500 m south of the centreline
Chalkidona	Agiou Athanasiou	Law 2508/97 Gov. Gaz. 31AAP/28-1-09	Approved	Area of primary sector activities	357 - 370	The area is designated for primary sector activities, which sets out specific requirements for building construction.
				Expansion of Gefira Settlement	366 - 367	There is a planned expansion of Gefira settlement to the north, close to the pipeline route (within 180 m of the centreline).
	Chalkidonos	Under House Act, Gov.Gaz 514D/1987	n.a	n.a	n.a	No designated land uses in the area under Law No2508. No designated land uses in the pipeline corridor as the existing Urban Plan under House Act is confined in the limits of the city of Chalkidona
Pella	Pella	Under House Act, Gov.Gaz.517D/2000	n.a	n.a	n.a	No designated land uses in the area under Law No2508. No designated land uses in the pipeline corridor as the existing Urban Plan under House Act is confined in the limits of the city of Pella

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Giannitson	Law 2508/97 Gov. Gaz. 385/6-8-09	Approved	Area of high productivity agricultural land	388 - 394	This is a solely an agricultural area, which is part of the Imathia-Pella productive and irrigated zone. Purpose of this designation is the protection of agricultural land. Borders of this area coincide with where land reclamation projects have been conducted. Permitted uses : • Residential housing • Agricultural facilities and agricultural production infrastructure • Small industry and professional workshops of low nuisance associating with processing agricultural products • scientific and research centres, institutes and workshops on agricultural production
	Kruas Vrussis	Law 2508/97 Gov. Gaz. 571/31-12-07	Approved	Areas of agricultural activities development	404.4 – 404.6, 407 - 408, 409.5 – 410.5	In these areas, off-plan land use is allowed and location of productive units of low disturbance, after those have received Environmental permits. Land uses and building restrictions are applied to this area according to their rural character. Several uses such as agricultural buildings, small industry, pump stations, residences and special uses as cemeteries are allowed under specific building requirements.

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Megalou Alexandrou	Law 2508/97 Gov. Gaz. 394/31-8-07	Approved	Area of high productivity agricultural land	399.5 - 404.3	This area is located in the southern part of the municipality (Megalou Alexandrou) and includes fertile parts of the Kariotisa and Galatades area. The land has been redistributed and there is a significant irrigation network. Land use allowed in this area includes agricultural infrastructure, small industry related to agriculture, pump station, and water tanks, residences, sport facilities and churches. Specific criteria in relation to each building type are required.
			Approved	Areas agricultural activities development	404.7 - 407	In these areas off-plan building is allowed, but the agricultural character must be protected from unregulated development. Agricultural development and land uses are permitted and building restrictions are in accordance with their rural character.
Skydra	Skydra	n.a	n.a	n.a	n.a	General Urban Plan has not been completed for this area
Naousa	Anthemion	n.a	n.a	n.a	n.a	General Urban Plan has not been completed for this area
Edessa	Edessa	Under House Act, Gov.Gaz 967/82	n.a	n.a	n.a	No designated land uses in the area under Law No2508. No designated land uses in the pipeline corridor as the existing Urban Plan under House Act is confined in the limits of the city of Edessa

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Vegoritida	Law 2508/97 Gov. Gaz. 198/6-5-2009	Approved	SPA 3 Archaeological Sites, SPA 3 Kato Grammatiko Kastle	north of 440 - 441	This is the designated archaeological area of Kato Grammatiko Kastle. Area is located far (750 m) from the pipeline route.
				Forested and Forest areas	436 - 437, 439 – 440.5	Protection of this area is under the provisions of existing forest law. Several land uses in this area are permitted, but permission must be sought from the forest authorities
				Areas for agricultural activities development	443 - 445	The general aim is to protect agricultural land and several land uses are allowed under specific requirements. • Agricultural infrastructure • Residence with specific building requirements • Professional workshops and small industry units related to agricultural activities after the permission of Forestry Authority • Tourist facilities up to 50 beds, outside the Natura Area
				Ano Grammatiko, south expansion Town Plan expansion	Far from the expansion	The Ano Grammatiko is going to expand south, in the opposite direction of the pipeline route, therefore there is no impact from the pipeline construction or operation

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
				Athletic centre and centre of coaching of Ano Grammatiko sport teams	437	The area is designated for the installation of athletic facilities close to Ano Grammatiko settlement. The area is a meadow area (400.000 sqm). It has been suggested that the development of the sport center is confined to 10 % of the total area of the meadow. The pipeline does not cross this area.
Amyntaio	Filota	-	Under study	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Variko	-	Under study	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
Eordea	Vermio	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
	Ptolemaida	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
	Mourikiou	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
Kastoria	Kleisouras	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
	Kastoria	-	Under study Phase B2*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*
	Kastoria	Zone of residential control Gov. Gaz. 125d/1986 and194d/2005	Zone of residential control	Zone 2, 3, and 6		The existing Zone of residential control sets building restrictions in the off-plan zone of Kastoria (Kapodistrias framework). Zone 3 and 6 agriculture as the main use and 2 several buildings as sports centres, and other facilities area allowed as long with residential use under specific building requirements
	Agiwn Anargirwn	-	Under study Phase B2*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Makednon	-	Under study Phase B1*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Agias Triados	-	Under study Phase B1*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Mesopotamias	-	Under study Phase B2*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Kastrakiou	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
Nestorio	Akritwn	-	n.a	n.a	n.a	General Urban Plan has not been completed for this area
Orestida	Orestidos	-	Under study Phase B2*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.
	Iwnos Dragoumi	-	Under study Phase B1*	n.a	n.a	General Urban Plan is under study. To be updated when further information is available.

Municipality Kallikratis ("new")	*Municipality Kapodistrias ("old")*	*General Urban Plan under Law 2508/97 or House Act*	*Approval Status*	*Designated Land Use crossed by the pipeline*	*Approximate pipeline chainage (KP)*	*Comments*

Notes: * Stages of the development plan approval process according to Law 2508/97:
Phase A: Analysis and presentation of existing baseline → Submission for consultation with planning authorities → Authorities feedback for Phase B1
Phase B1: Proposal → Submission for consultation with planning authorities → Authorities feedback for Phase B2
Phase B2: Proposal → Submission for consultation with planning authorities and municipal council → Adaptation of Phase B2 proposal according to consultation → Final approval from planning authority →
Publication in the official gazette

Collated by ERM (2011; KP 365-453) and ASPROFOS (2013; KP 0-365)

In addition to formally approved and pending urban plans, information was also collected from local authorities, communities and government sources on local development priorities and plans in the area of the pipeline. *Table 6-108* presents these, which range from early stage plans or priorities that have not yet been submitted to the municipality authorities, to approved and financed plans, along with a number of approved development plans that have stalled due to lack of financing.

Table 6-108 Local Development Priorities and Planning in the Study Area

Municipality	*Local Community*	*Settlement*	*Development Plan*	*Approval Status*	*Comments*
Alexandroupoli	Alexandroupoli	Amfitriti	Waste treatment plant	Under approval	Waste treatment plant in the municipality of Alexandroupolis. A preliminary design is in place and currently is in the phase of selecting a contractor.
	Kipoi	Kipoi	Development and improvement of Evros' dikes	No formal plan submitted	Possible development and improvement of river Evros' dikes.
	Kipoi	Kipoi	Extension of customs' facilities	No formal plan submitted	Possible extension of customs' facilities in Kipoi. Not included in the study area but important development for the broader area.
	Mesti	Mesti	New irrigation pipeline (D600 / 25.8 km) at Alexandoupoli	Pending	New drain line in the Municipality of Alexandroupoli from Mesti to Alexandroupoli.
Maronia - Sapes	Sapes	Chamilo	Biological treatment plant in the Municipality of Maronia - Sapes	Under Approval	Preliminary design of a biological treatment plant, 20 m distance from existing national gas pipeline. Currently is in the phase of selecting a contractor.
	Lofario	Lofario	Improvement of regional road No 2	Approved	Improvement of regional road No 2 starting from river Lissos to Sapes.
Komotini	Thrilorio	Fylakas	Land redistribution plans	No formal plan submitted	Land redistribution plans to Thrilorio area, towards west.
	Kosmio	Kosmio	Development of building facilities in Kosmio	Approved	Development of teaching and living building facilities for people with disabilities in Alonia location of Kosmio.
	Meleti	Meleti	Hospital development in Scholi Astynomias	Approved	Hospital development close to the area of Scholi Astynomias. 200 m distance from the existing national gas pipeline. Funding through NSRF (ESPA) programme
	Meleti	Meleti	Development of a water pipe in Meleti	Under Approval	Development of a water pipe system in between Meleti and Aigeiros.
	Komotini	Mesochori	Management study of torrents Vosvozi – Trelochimaros	Under Approval	Management study of torrents Vosvozi – Trelochimaros in Komotini. An EIA has been submitted to the Regional authority of Eastern Macedona – Threace.
	Komotini	Komotini	Development of Interconnector Greece – Bulgaria High Pressure Natural Gas Pipeline (IGB)	Approved	Construction of the high pressure natural gas pipeline connecting Greece and Bulgaria
Iasmos	Iasmos	Galini	Biological treatment plant in Galini	Under Approval	Development plans for a biological treatment plan in Galini, north of Egnatia road.
	Iasmos	Galini	Sewage network system in Galini	No formal plan submitted	Future plans for a sewage network system south of Galini, starting from Dialampi to Koptero

	Iasmos	Iasmos	Improvement of regional road from Xanthi to Iasmos	Approved	Improvement of regional road between municipalities of Xanthi and Iasmos.
Avdira	Selero	Polysitos	Improvement of regional road network No 2 Simantra – Polysitos	Approved	Final design of regional road network No 2 Simantra – Polysitos improvement. Funding through NSRF (ESPA) programme
	Diomidia	Vafeika	Management of Kosynthos river up to Vafeika	Approved	Currently the management of Kosynthos river, up to Vafeika, is in progress. Plans for future management study from Vafeika up to the end of river Kosynthos through NSRF (ESPA) funding programme exist.
Topiros	Toxotes	Thalassia	Improvement and widening of regional road No 7 Thalassia – Evlalos	Approved	The regional road No 7 Thalassia – Evlalos is currently under construction.
Kavala	Nea Karvali	Nea Karvali	Waste management unit	Approved	Development of a waste management unit in municipality of Kavala
	Nea Karvali	Nea Karvali	Development of a new railway in the Municipality of Kavala.	Under Approval	Plans for future construction of a new train line in the municipality of Kavala, from Nea Karvali to Toxotes
	Kavala	Kavala	Development of Egnatia connection roads between Drama – Kavala	No formal plan submitted	The development of Egnatia connection roads between Drama – Kavala is currently under design. TAP pipeline crosses these roads.
Nea Zichni	Nea Zichni	Nea Zichni	Development of sewage network to the wastewater treatment of Nea Zichni	Approved	Two separate studies for the completion of the sewage network to the wastewater treatment plant of Nea Zichni are under tender
	Nea Zichni	Nea Zicnhi	Development of 9 Landfills in the municipalities of Nea Zichni, Amfipoli and Visaltia of Regional Entity of Serres	Approved	Reinstatement of nine landfill sites located in the municipalities will be completed in 2014.
Amfipoli	Amfipoli	Amfipoli	Development of 9 Landfills in the municipalities of Nea Zichni, Amfipoli and Visaltia of Regional Entity of Serres	Approved	Reinstatement of nine landfill sites located in the municipalities will be completed in 2014.
Emmanouil Papa	Neochori	Neochori	Development of irrigation system in Neochori	Under Approval	Development of an irrigation system in Neochori.
Serres	Provatas	Provatas	Future Development plans for Monoklisia and Provatas	No formal plan submitted	Future Development plans for Monoklisia and Provatas
Lagkada	Dorkas	Karteres	Development of new power transmission line (400 kV) 'Thessaloniki – Bulgaria'	Approval pending	Development of new power transmission line (400 kV) at Lagada, in the area of Dorkadas – Karteres. TAP pipeline crosses this project.
Lagkada	Assiros	Assiros	Development of a new connection road between Thessaloniki - Kilkis	Approved	The development of a new main road at Thessaloniki – Kilkis in the section Assiros – N. Santas. Road width 8.20 m. Construction is planes to be finish on 05 – 05 – 2015.

Chalkidona	N.Messimvria	N. Messimvria	Irrigation system to be constructed in Nea Messimvria	Approved	Planned to start at 2012. There is no spatial information as to where the irrigation system will be constructed.
	Valtochorio	Valtochorio	Drainage/anti flood work	No formal plan submitted	Drainage/anti flood work, some channels have been blocked and during the winter many houses are being flood. Community is trying to get funding from municipality. No specific spatial information on drainage/anti flood work location. No interaction with the pipeline construction or operation
Skydra	Kalivia	Kalivia	Cleaning of two irrigation channels	No formal plan submitted	Community's priority to clean and restore two irrigation channels. No funding available. No interaction with the pipeline construction or operation
	Kalivia	Kalivia	Two additional boreholes for irrigation	No formal plan submitted	Community's priority to drill two additional boreholes for irrigation. No funding available. No specific spatial information on location. However there is no anticipated interaction with pipeline construction or operation.
Edessa	Flamouria Grammatiko	Agia Foteini Kato Grammatiko	Integrated Programme for the sustainability of Vermio mountain	Approved	The Integrated Programme for sustainability of Vermio mountain has been approved in 2010, and has a total budget of €198,600,000. Initiatives include: • Improving infrastructure and connectivity • Development of alternative eco-tourism • Enhancement of local agriculture and local products • Protection of natural and cultural environment and improvement of quality of life • Technical help • The programme includes part of Pella, Eordea, Naousa municipalities. • No specific actions has yet defined, planed, or scheduled • Community however has expectations for eco-tourism development No specific action yet defined in the Project area. However, it is not expected to have any interference with the construction or operation of the pipeline.
	Grammatiko	Ano Grammatiko	Development of road connection between Ano and Kato Grammatiko	No formal plan submitted	It is an important development priority for the community to restore the road connection between Ano Grammatiko and Kato Grammatiko. Pipeline crosses area of future road restoration.

Eordea	Pentavrussos Perdikkas Droseron Galateia	Pentravrussos Perdikkas Droseron Galateia	Development of sewer pipes to connect villages to the waste treatment plan in Ptolemaida	Environmental permit, approved	Study for development of sewer pipes to connect villages to the waste treatment plan in Ptolemaida, including many villages of Eordea municipality such as Droseron, Galateia, Perdikkas and Pentavrussos, which are in the study area. The study has an environmental permit and the plan was submitted in 2011 to get funding from the National Strategic Reference Framework 2007-2013. The pipeline crosses the area of the future sewage system, close to Galateia village.
	Droseron	Droseron	Irrigation dam	Unclear if formal plan has been submitted	Plans for a dam will be 5 km away from the village. This will be used for an irrigation system. No plans available
	Droseron	Droseron	Road network	Approved	Roads are in the process of being built (currently on hold). These are outside of the village away from the corridor.
	Droseron	Droseron	Livestock rearing facilities	No formal plan submitted	Studies are being undertaken to develop livestock rearing facilities i.e. stables. No interference with the pipeline
	Galateia	Galateia	Solar panels	Pending	Many farmers of the community have applied for solar panel installation in Regulatory Authority of Energy. Applications are recorded by the REA.
Amyntaio	Variko	Variko	Irrigation dam	No formal plan submitted	An irrigation dam to enable the community to switch from underground irrigation to other type of irrigation is considered the first development priority of the village. However, plans and studies are yet to be conducted.
Kastoria	Vasilleiados	Verga and Agia Paraskevi	Kleisoura tunnel and road	Approved	Road and Kleisoura tunnel has been approved, but there is lack of funding. Pipeline does not cross the area.
	Tsakoni	Tsakoni	Development of waste water treatment system	Approved	Development of waste water treatment system has been approved, it is expected to start in spring of 2012.
	Korissos	Korissos	Integrated Programmes for the Development of Agricultural Area	Pending	Community has applied for the Integrated Programme for the Development of Agricultural Area.
	Korissos	Korissos	Renovate the entertainment centre in Agios Dionysios and the folklore museum of the village	No formal plan submitted	Community will apply for financing to renovate the entertainment centre in Agios Dionysios and the folklore museum of the village.
	Korissos	Korissos	Drilling of new borehole	No formal plan submitted	The community will like to build a new borehole. No specific location, no interaction with the pipeline.
			Development of wastewater pipeline from Korissos	Approved	There is an existing wastewater pipeline which is in development – expected to be completed in 2013. Pipeline crosses future development close to Korissos village.

	Kleisoura	Kleisoura	Solar panels	Approval pending	Farmers submitted application for solar panels installations. No specific location yet.
	Kleisoura	Kleisoura	Road to connect Vlasti and Numfaio	Approved	Half built; ran out of funding. No interaction with the pipeline.
	Dispilio	Dispilio	Industrial zone development	Approved	Industrial zone development in the area of Argos Orestiko and Maniaki, north of the pipeline route, has been approved but not completed due to lack of funding. Industrial zone is located away from the pipeline corridor.
	Dispilio	Dispilio	Urban plan expansion	Approval pending	Urban plan expansion and housing zone area to be approved with the approval of Kastoria Urban Planning. Currently the Kastoria Urban Planning is in Phase B, approval is pending.
	Lithia	Lithia	Restoration of public building	Approval pending	Community plans to restore public buildings and ask funding from the municipality. There is no interaction with the pipeline
	Lithia	Lithia	Replace asbestos watertanks	Approval pending	Community plans to ask funding from the municipality. There is no interaction with the pipeline
	Chiliodentro	Chiliodentro	Repair settlement's roads	No formal plan submitted	Local community plans to ask from the municipality funding for repairing settlement's road asphalt, but there is no funding available so far. No specific plan yet as to which roads to repair.
	Chiliodentro Agia Kuriaki	Chiliodentro and Poreia Agia Kuriaki	Nestorio irrigation dam in Nestorio municipality	Approved	Planned to finish construction in 4 years. After the dam is constructed they will build the pipe network to distributed water to the fields and they will be able to change to dynamic cultivations (more profitable like clover, beans). The pipe network is not yet defined.
	Oinoi	Oinoi	Irrigation dam	Approved	Above the road, at the stream, there is a development plan for an irrigation dam. People from the municipality have studied the area, but no money is available. It is very important for the community, as the irrigation for the area has changed and if water is available in larger quantities they will be able to change to more profitable crops instead of wheat and cereals. The pipe network is not yet defined.
	Oinoi	Oinoi	Bridge over a stream	No formal plan submitted	It is unclear if the community has asked for funding and been rejected or plans to ask for funding from the municipality. Location far away from the pipeline corridor
Orestida	Militsa	Militsa	Pavement improvement	No formal plan submitted	It is unclear if the community has asked for funding and been rejected or plans to ask for funding from the municipality No interaction with the pipeline
	Militsa	Militsa	Configuration of recreation area in the settlement area	No formal plan submitted	It is unclear if the community has asked for funding and been rejected or plans to ask for funding from the municipality. No interaction with the pipeline
	Ampelokipi	Ampelokipi	Improvement of road network	No formal plan submitted	Local community plans to improve local road network, no funding yet from the municipality. Location not yet defined.

Collated by ERM (2011; KP 365-453) and ASPROFOS (2013; KP 0-365)

6.4.3 Demographics and Settlements

6.4.3.1 Population and Settlements

According to the 2011 census, the population of Greece is 10,815,197 people[56], which is 1% lower than the population recorded during the 2001 census (10,934,097 people). This relative decline can be attributed to various factors including; low birth rate, an ageing population and reduced rates of immigration. Approximately 17% of the Greek population lives in the Region of Central Macedonia and a smaller percentage of the population lives in East Macedonia – Thrace (6%) and West Macedonia (3%)

The pipeline corridor crosses 3 regions, 31 municipalities, 89 local communities and 98 settlements (see maps in *Annex 4.6 – Land Use and Socioeconomic Environment*). Six of the 31 municipalities crossed by the pipeline, do not have any settlements within the socioeconomic study area. These are the municipalities of Soufli, Arrianon, Xanthi and Prosotsani in East Macedonia – Thrace, the municipality of Kilkis in Central Macedonia and the municipality of Nestoria in West Macedonia. These 6 municipalities have been included in the list of municipalities presented in *Table 6-109* below and in the land use section, but will not be otherwise referenced[57].

As shown in *Table 6-109* , approximately 67,767 people live in the 98 settlements found in the socioeconomic study area. Settlement populations vary throughout the study area, from very small settlements of about 10 inhabitants (Ano Grammatiko in Edessa municipality), to others with populations of more than 3,000 people (e.g. Drymos and Pentalofos, both in Oreokastro municipality). The size of each settlement and population density is often determined by its location: whether it is located in a mountainous or lowland area, settlement accessibility and its distance from a larger population centre.

[56] *ELSTAT, Press Release 28-12-2012.*
[57] It must also be noted, that among the settlements listed in Table 6-109, the 4 settlements in the municipalities of Emmanouil Pappa (2 settlements), Chalkidona (1 settlement) and Amfipoli (1 settlement) are very close but not in the study area. These settlements were included in the field study and focus groups, key informant interviews and community meetings were held in the settlements in order to investigate probable impacts of the project to the local population, but no household surveys were conducted there.

Table 6-109 Population Data for the Study Area (2011)

Region	*Municipality*	*Number of Local Communities*	*Number of Settlements*	*Total Population*	*Average Settlement Population Size*
East Macedonia – Thrace	Soufli	0	0	0	0
	Alexandroupoli	6	7	2,397	342
	Arrianon	0	0	0	0
	Maronia - Sapes	2	3	1,038	346
	Komotini	6	6	2,222	370
	Iasmos	3	3	2,294	765
	Avdira	4	7	3,404	486
	Xanhti	0	0	0	0
	Topiros	2	3	514	171
	Nestos	4	4	1,521	380
	Kavala	4	6	9,435	1,572
	Doxato	2	2	1,051	525
	Prosotsani	0	0	0	0
Central Macedonia	Amfipoli	1	1	252	252
	Nea Zichni	5	4	4,916	1,229
	Em. Pappa	2	2	2,222	1,111
	Serres	7	4	2,920	730
	Iraklia	2	3	792	264
	Kilkis	0	0	0	0
	Lagada	2	3	2,513	838
	Oreokastro	3	3	8,968	2,989
	Chalkidona	5	5	8,103	1,621
	Pella	2	2	1,381	690
	Skydra	4	6	4,552	759
	Naousa	1	1	139	139
	Edessa	2	3	455	228
West Macedonia	Eordea	6	4	2,541	635
	Amyntaio	2	2	1,062	531
	Kastoria	10	12	7,089	591
	Orestida	2	2	1,039	520
	Nestorio	0	0	0	0
Total		**89**	**98**	**67,767**	**N/A**

Source: Census 2011, Hellenic Statistical Authority (provisional data).

The settlement of Drymos in the municipality of Oreokastro (Central Macedonia) has the largest population (3,659 inhabitants) and there are a total of 10 settlements with a population of over 2000. However, the majority of the settlements (approximately 77%) record a population of less than 1,000 inhabitants, and a further 13% have a population of between 1,000 and 2,000 inhabitants. There are 9 medium to large population centres near the socioeconomic study area (2.5 – 11 km away), which are a focus for administration, commerce and employment. Many of the inhabitants of the settlements in the study area travel daily to one of these centres for work or use of public services..

Box 6-6 presents a brief description of each large population centre relevant to this study.

Box 6-6 Population Centres

Alexandroupoli: The city of Alexandroupoli is the capital of Evros regional authority with an estimated population of 58,125 people (2011 census). The city is an important commercial centre for North East Greece, with its port seen as one of the main "gates" to Eastern European and the Balkans. The surrounding area is mainly flat plain with considerable agricultural activity (mainly cultivation of cotton, wheat and sugar beet)[58].

Komotini: The city of Komotini is the capital of the region of East Macedonia - Thrace and of the Rhodope regional authority, with a population of approximately 54,272 people (2011 census). Archaeological findings indicate that Komotini has existed since the 2nd century AD. It is a multi-cultural city and almost 50% of the city's population are Muslims. An industrial area was created outside Komotini in 1978 and is now seen as the focus for a large portion of the city's economic activity[59].

Xanthi: The capital of the Xanthi regional authority dates back to 879 AD[60] and its current population numbers 56,151 people. Xanthi, is known as "the city of thousand colours" as, like Komotini, the city is multi-cultural with a mixed population of both Christians and Muslims. The surrounding area is well known for the production of the flavoured tobacco variety called "Basmas"[61].

Kavala: The city of Kavala is situated on a Bay across from the island of Thasos. Settlers from the island of Thassos founded it at the end of the 7th century BC. Today, it is the second largest city in northern Greece and the principal seaport of East Macedonia. According to the 2011 census, it has a population of 56,371 inhabitants. Kavala was greatly involved in the processing and trading of tobacco and many old buildings related to the storage and processing of tobacco are still preserved in the city. Its main sector of production is services, which includes public services, tourism, retail sales and real estate,

Drama: The historical city of Drama is traced back to the 4th century BC. The modern city with its 44,823 inhabitants (2011) is an economic, cultural and athletic centre. The city is also known for its natural wealth in running water. In the recent past, the economy of the area relied heavily on the local paper and textile industries. These industries have closed down or moved across to Bulgaria, with an adverse impact on local economy. The area's economy today relies mainly on agriculture, small-scale mining (particularly marble) and forestry. The city hosts a well known annual commercial exhibition for the promotion of local products.

Serres: The city of Serres is situated in a fertile plain at the eastern edge of Central Macedonia, about 24km northeast of the Strymon river and 69 km northeast of Thessaloniki. The city was first mentioned in writing as "Siris" by the Greek historian Herodotus in the 5th century BC[62]. Serres is the capital of the regional unit of Serres and its population is estimated as 59,376 people (2011 census). There is a large industrial area just outside the city and the surrounding agricultural area is highly productive, due to the large areas of irrigated land.

Alexandreia: Alexandreia is a city in the Imathia regional unit of Central Macedonia, with a population of 14,821 (2011 census). Alexandreia has experienced rapid development is last few years, becoming the third largest city in the Imathia regional unit just after Naousa[63]. The city is situated 50 km west of Thessaloniki. The surrounding area is mainly flat plain with agricultural activity.

Kastoria: Kastoria is a city in northern Greece in the region of West Macedonia. It is the capital of Kastoria regional unit with an estimated population of 13,387 inhabitants (2011 census). It is situated on a promontory on the western shore of

[58] http://www.alexpolis.gr/
[59] http://www.kom.gr/
[60] http://www.xanthi.ilsp.gr/thraki/
[61] http://www.ota.gr/eng/xanthi/
[62] Sérrai, Siris, or Serres." The Columbia Encyclopedia, 2004.
[63] http://www.dimosmakedonidos.gr

Lake Orestiada, in a valley surrounded by limestone mountains. The town is known for its many Byzantine churches, Ottoman-era domestic architecture, trout and fur clothing industry which dominates the local economy[64]. Other industries include the sale and distribution of locally grown produce, particularly wheat, apples, wine and fish.

Ptolemaida: The city of Ptolemaida is the capital of Eordea municipality in West Macedonia with a population of 32,127 inhabitants (2011 cencus). It is situated 28 km northwest of Kozani and it is surrounded by Askio, Vora and Vermio mountains. Ptolemaida is a highly industrialized area. The four power plants in this area produce 70% of Greece's electrical power, using the large local deposits of lignite as fuel. The main crop in Ptolemaida Basin is corn.

Source: Social Survey for the TAP Greece ESIA, (2011 and 2013)

6.4.3.2 Migration and Population Change

Greece is a country with a long history of migration and until the 1980's large numbers of Greeks moved to other countries in Europe, to the United States and Australia. This trend was reversed from the early 1990s onwards when Greece experienced both an inflow of returning Greeks, notably Pontic Greeks from the former Soviet Republics (Georgia, Kazakhstan, Russia and Armenia) and other repatriated Greeks arriving from northern Europe and non-EU countries.

During the same period, there was also immigration from various other groups including economic migrants from Asia, Africa and large numbers from Albania and other ex-socialist countries of Eastern Europe. Central and East Macedonia -Thrace, have a high number of immigrants from eastern European countries and from the Balkans, which is primarily a result of its location and proximity to the Greek border and these countries.

According to the 2001 census[65], 797,091 foreigners live permanently in Greece, comprising 7% of the total population. This was an increase of over 650,000 since the 1990 census, which accounts for a large proportion of demographic growth in Greece during this decade[66]. Detailed data on the demographic impact of immigration in Greek regions is not consistently available, but according to some researchers[67], the impact of immigration has not significantly changed the overall demographic structure of northern Greece[68].

[64] http://www.kastoria.gr/
[65] Relevant results from the 2011 census are not publicly available yet.
[66] Gropas, R. & Triandafyllidou, A. (2005). *Migration in Greece at a Glance.* ELIAMEP. Country Report prepared for the project POLITIS (funded by the European Commission).
[67] Kostaki, A., Kotzamanis, B. & Agorastakis, M. (2009). Effects of immigration on population growth and structures in Greece – A spatial approach. *Vienna Yearbook of Population Research,* 2009, pp. 167-195.
[68] According to the researchers (Kostaki et al., op. cit), the municipalities that have been affected in terms of demographical features are mainly the ones located in the economically developed areas of central continental Greece, in parts of Peloponnesus and Crete, as well as on some Aegean and Ionian islands that have been developed for tourism and finally at the border with Albania.

Local level data from the recent census of 2011 is not available yet, but estimates from the 2010 Labour Force Survey, suggest that immigrant numbers have increased by only 2%[69] in the last ten years with the numbers of foreigners coming to Greece significantly reduced due to the economic crisis[70]. In addition to reduced immigration flows, in the period 2010-11 an estimated 55,000 Greeks have emigrated abroad.

Municipalities within the study area have experienced changes to population numbers, with almost all of the municipalities in the socioeconomic study area (with the exception of Iasmos Topiros and Naousa) experiencing some population increase between 1991 and 2001. This trend was reversed between 2001-2011 for some municipalities, such as Amfipoli and Emmanouil Pappa, which experienced severe decreases in population (29% and 26% respectively). Others such as Alexandroupoli and Komotini experienced some increase (about 10%), whilst Oreokastro recorded a massive population increase (52%). As a result, the total population of the study area has an average decrease rate of about 4%. *Table 6-110* below presents population changes for the municipalities within the socioeconomic study area between 1991 and 2011[71].

[69] OECD (2012). International Migration Outlook. Available online at : http://www.oecd.org/migration/internationalmigrationpoliciesanddata/internationalmigrationoutlook2012.htm
[70] ELSTAT, 2010, See also: www.ypes.gr/el/MigrationSocialIntegration/
[71] *Following the specific guidance and instructions* of the 2008/763 Regulation, The procedure and methodology that was followed during the 2011 census differs in many aspects from the previous ones, i.e. duration of the census, registration of people in their permanent residence etc. Consequently, it must be noted that the 2011 census results are not absolutely comparable with the older ones.

Table 6-110 Population Change (%) in the Wider Study Area

Municipality	*Change (%) 1991-2001*	*Change (%) 2001-2011*
Alexandroupoli	19.27	10.72
Maronia - Sapes	1.08	-14.27
Komotini	5.33	10.47
Iasmos	-5.53	-7.25
Avdira	7.78	2.33
Topiros	-2.91	-5.37
Nestos	7.12	-4.92
Kavala	6.14	-4.88
Doxato	2.79	-13.64
Amfipoli	2.41	-29.04
Nea Zichni	6.84	-17.75
Em. Pappa	7.76	-26.10
Serres	6.13	2.11
Iraklia	1.18	-9.32
Lagada	7.15	-3.56
Oreokastro	55.10	52.15
Chalkidona	5.68	-4.19
Pella	8.69	-3.69
Skydra	2.92	-5.00
Naousa	-0.76	-4.94
Edessa	2.47	-2.58
Eordea	6.33	-2.34
Amyntaio	0.51	-8.76
Orestida	0.75	-11.63
Kastoria	3.45	2.10

Source: Hellenic Statistical Authority, Census 1991, 2001, 2011 (provisional data), recalculated for the new municipality boundaries (after Kallikratis). 2001 recalculation: ELSTAT, 11-11-2011.

The closure of a number of industries in the study area and a lack of employment opportunities following the economic crisis has reportedly resulted in internal and external migration. During the field visit it was confirmed that 2 of the settlements in the study area (Pimni in the municipality of Topiros and Scholi Astynomias in the municipality of Komotini), are completely deserted as a result of internal migration. In addition, the settlement of Meleti (in the municipality of Komotini) has gradually lost the majority of its inhabitants (60%) and Mesochori (in the municipality of Kavala) has lost 30% of its population. In addition to issues of unemployment, focus group participants stated that availability of public transportation to and from nearby centres can also affect levels of migration. In Symvoli (in the municipality of Amfipoli), one of the main reasons

reported for people's migration to other settlements was the inadequacy of transportation to the city of Serres.

Although some settlements reported losses, the majority of the settlements in the study area reported maintaining fairly constant permanent population levels throughout the year. However there are some examples of locations that experience seasonal changes of varying degrees. An example of this is in the settlement of Symvoli (in the municipality of Amfipoli), where residents reported a 60% population change during the summer months, when younger people return for their holidays. The occasion is celebrated with a local festival called "the meeting of migrants", to welcome friends and relatives who are back for the summer season. Another example includes settlements of Ano and Kato Grammatiko in Edessa municipality (Central Macedonia) where residents reported that a large proportion (more than 50% in Ano Grammatiko) of the settlement is seasonal. Some elderly residents remain all year, but younger people and families only spend summers in the settlement. Important seasonal changes are also seen in the settlements of Lachanas and Evaggelistria (Lagada municipality), Kefalochori (Iraklia), Gazoros (Nea Zichni) and Galini (Iasmos), where almost half of the population is seasonal.

Twenty four (24.5%) of the settlements in the socioeconomic study area reported that seasonal economic migrants come to the area to work in agricultural production, mainly during the summer months. Seasonal migrants come to Greece primarily from Albania but also from Bulgaria.. Bulgarian seasonal migrants were reported in a number ofsettlements, including Nea Mesimbria (Chalkidona municipality), Purgoi (Eordea municipality), Korissos (Kastoria municipality), Kalokastro (Iraklia municipality), Nea Zichni (Nea Zichni municipality), Feloni (Avdira municipality), Symvoli (Amfipoli municipality) and Koptero (Iasmos municipality). The number of migrants ranges with large numbers of Albanian seasonal workers found in Rizon and Kalivia in Skydra municipality (350-500) and smaller numbers of between 5-7 Albanian seasonal migrants in Kato Grammatiko (Edessa municipality), Droseron (Eordea municipality) and Kleisoura (Kastoria municipality). In the settlements reporting small numbers of migrants, residents stated that the same people return to work in the summer every year.

6.4.3.3 Age

The Greek population is ageing in line with the rest of Europe, with 16.7% of the population recorded as over 65 in 2001. This increase in the number of elderly people has been accompanied by a decrease in the number of children, with numbers dropping to 15.2% in 2001. *Table 6-111* below provides the age profile in Greece from 1981 until 2001.

Table 6-111 Age Profile in Greece, 1981-2001

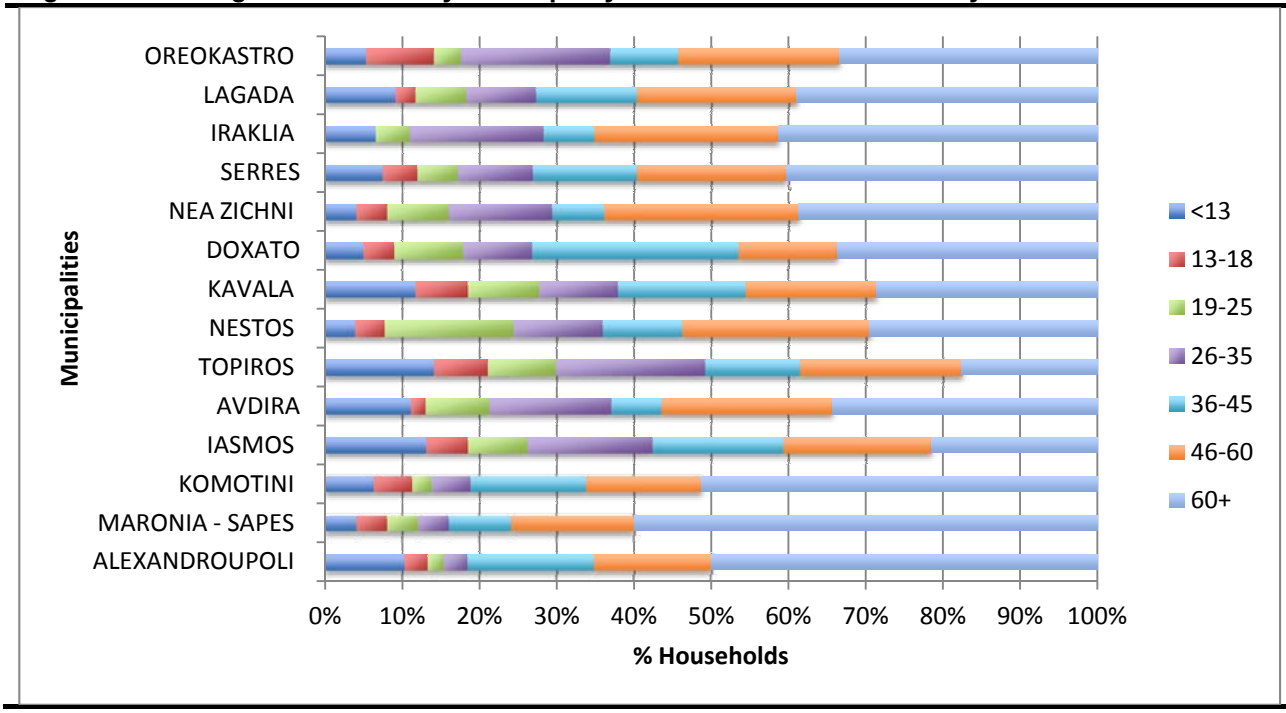
Age group	*1981*		*1991*		*2001*	
	Population	*%*	*Population*	*%*	*Population*	*%*
0 - 14	2,307,297	23.7	1,974,867	19.2	1,664,085	15.2
15 - 64	6,192,751	63.6	6,880,681	67.1	7,468,395	68.1
65+	1,239,541	12.7	1,404,352	13.7	1,831,540	16.7
Total	**9,739,589**		**10,259,900**		**10,964,020**	

Source: Hellenic Statistical Authority

Changes in Greece's age profile are primarily a result of low total fertility rate (1.38 children per woman), higher death than birth rate (10.7 deaths over 9.21 births per 1,000 population) and the highest life expectancy in the Balkans at almost 80 years.

Within the study area, a large proportion of household survey respondents were aged over 46, with large numbers of elderly residents reported in certain municipalities. In Maronia – Sapes 60% of respondents were aged over 60 as are over half of respondents in Komotini (51%) and Alexandroupoli (50%), with the average age being between 46 – 59 years in most municipalities. In only four municipalities (Topiros, Iasmos, Kavala and Oreokastro) was the average age (i.e. 39-44 years) lower than the above. The youth segment of the population (up to 25 years of age) is small in all municipalities, with the exception of Topiros (30% of the surveyed population), Kavala (28%), Iasmos (26%) and Nestos (25%). Age distribution for the municipalities in the socioeconomic study area, according to the results of the household survey, is presented in *Figure 6-95.*

Figure 6-95 Age Distribution by Municipality in the Socioeconomic Study Area



Source: Household Survey for the TAP Greece ESIA (2013)

During focus group meetings in the study area, elderly people reported that they feel detached from social and political life, with the majority of their day revolving around the village coffee shop, where they meet their friends and play cards. Most elderly people interviewed during focus groups meetings were living near their children, but in a separate house of their own, in order not to "disturb" young people. They often continue to support their children, either by helping with agricultural "as permitted by their strengths", or sharing their pension, especially when their children are unemployed. When children have migrated to large population centres or abroad, elderly people have to rely on the support of other relatives and neighbours for help them in everyday life. The box below presents a general outline of the living conditions of elderly people in the socioeconomic study area.

Box 6-7 Comments on the Living Conditions of Elderly People from Focus Groups

"They (elderly people) cannot do much and endure long hours of work. As permitted by their strengths, they help their children in lighter jobs(…)They stay in their own home because they believe that their presence might disturb. Young people have other habits."." **(Elderly Focus Group –Koptero, municipality of Iasmos)**

"*Those who can work, help in the fields. Those who cannot work, they spend time in the coffee shop.*" **(Elderly Focus Group –Probatas, municipality of Serres)**

"*They live close to their children, but not with them (…). They do not want to be with the couple so as to avoid misunderstandings. Society has changed and the young people have another way of thinking. Often the elderly do not agree. For example, if an elderly is watching TV with young people and there is an indecent scene in a movie, one feels uncomfortable, closes one's eyes and pretends to sleep. It is not nice to get in trouble. It is better to let young people to live as they like, think and want.*" **(Elderly Focus Group – Magiko, municipality of Avdira)**

"*There are people who represent them (the elderly), they do not express themselves directly. In addition the opinion of the young is respected more than the opinion of the elderly.*" **(Elderly Focus Group – Neochori, municipality of Emmanouil Pappa)**

Source: Field Survey for the TAP Greece ESIA (2013)

6.4.3.4 Gender

At a national level, men and women are equally represented in terms of total population 5,303,690 men (i.e. 49.2%) and 5,484,000 women (i.e. 50.8%)[72]. This is reflected in the study area where the majority of municipalities have equal numbers of men and women. The only exception to this is Avdira where there are more men than women (60:40)[73].

Legislative rights and obligations are the same for both sexes, in addition to equal access to education and healthcare. However, in remote rural areas the society often remains patriarchal and women's roles remain strongly tied to the home. According to recent research findings[74], women in rural areas of northern Greece are less likely to start new businesses, due to a lack of confidence, education and technical support, including access to information and subsidies. This limits women's ability to independently support themselves without financial assistance from their husbands.

Focus groups with women in the study area reported high female participation in the workforce, but that this is often in the form of informal employment - e.g. women working in family fields -

[72] El.STAT, 2011 Census (Preliminary Results), Press Release 22-07-2011.
[73] There was no information available for the reason of this differentiation. During the field survey it was reported in the focus groups that there is a recent increase of female morbidity (see Section 6.4.9.5).
[74] Pitoska, E. & Charitoudi, G. (2011). Women's Entepreneurship and Local Development: A Case Study in Northern Greece. *International Conference On Applied Economics*, ICOAE, Conference Proceedings, pp. 483-494.

and not as an independent source of income. Household survey data found that between 11% and 31% of the female population in surveyed households within the corridor is economically active. This low figure is partly due to a high percentage of non-working age females (pensioners and children) in the local population, ranging from 4% in Naousa to 64% in Maroneia-Sapes. The number is also likely to be skewed because of the timing of surveys (during daylight / working hours), meaning that households where both men and women are working will have been under sampled. Relatively few women reported 'housewife' as their main activity.

Women focus groups across the study area reported having equal opportunities to access health and education, equal say in decision-making in the home and an active role in cultural and sensitive social issues (e.g., charitable associations). Participation in community level decision-making by women appears to vary considerably on a settlement-to-settlement basis. In most cases where women are very active (for example in the villages of Kato Grammatiko in Edessa and Korissos in Kastoria), women reported that they often go around the official local council to request services and solutions directly from municipal level authorities. Women across the study area argued that over the past few decades much progress has been made in regards to female participation in community level decision making and, in a handful of cases, women are now elected as members of the municipal or local council. However, this optimistic view is countered by a number of field observations indicating that participation of women in village level decision-making is actually low. In most settlements it was difficult to organize a female focus group, as women were occupied in the household, while participation of women in the community meetings conducted throughout the study area was rare.

Some of the settlements of the study area (in the municipalities of Nea Zichni, Serres, Maronia-Sapes etc.) preserve the custom of "Gynecocracy" (dominance of women) or "Day of the Babo" ("Babo" = old woman or grandmother). The custom is that on one -day per year (on the 8th of January) men have to stay at home and undertake all domestic chores, while women spend the day in the coffee shops of the village. The custom also includes a feast that invokes and honours femininity and fertility while, at the same time through the ritualistic reversal of gender roles, expresses the need of women to claim power and independence - if only for one day. *Box 6-8* presents some of the main aspects of gender relations in the socioeconomic study area.

Box 6-8 Comments on Gender from Focus Groups

"*In the past the woman's position was much lower and her views were not considered. They were getting married and giving birth at a very young age. As time went on this issue changed and continuously changes, due to the mentality of the new generation. Now women are married at an older age compared to the past and participate quite a bit in decision making for issues related to the house and the community*." **(Women Focus Group –Evaggelistria, municipality of Lagada)**

"*Nowadays, agricultural business is highly mechanized and women lack the necessary skills for this type of work (…) In the past women were working in the small industries near the settlement. Now they are engaged with housekeeping. Their role is to manage all household affairs.*" **(Women Focus Group –Monokklisia, municipality of Serres)**

"*They (women) participate like their husbands. None of them has a good income. (equality is experienced as a common deficiency).*" **(Women Focus Group –Vaniano, municipality of Topiros)**

"*Women administer the income concerning the basic needs of every day life. Sometimes it seems that they (men) decide, but the determinant influence originates from the women. (…) Financial independence - that has provided women with more confidence and independence. This might change again in the future and there is a shift to the older more traditional household model (…) When a woman is not employed issues regarding equality arise.*" **(Women Focus Group – Amygdaleonas, municipality of Kavala)**

"(Muslim women are nowadays) better treated and they have more freedom. Muslim women drive their own cars, they are more modern. We (Christian women) are still using donkeys for transportation" **(Women Focus Group –Amaxades, municipality of Iasmos)**

"*Only men discuss village issues. If a man stands and presents a problem, people will listen to him more*" **(Women Focus Group - Variko, municipality of Kastoria)**

"*The head of community seems to make decisions, but in fact we [the women of the village] try to resolve the important issues ourselves*" **(Women Focus Group - Kato Grammatiko, municipality of Edessa)**

Source: Field Survey for the TAP Greece ESIA (2011 and 2013)

6.4.3.5 Ethnicity, Religion and Cultural Identities in the Study Area

Greece is a largely ethnically homogeneous country, primarily as a result of population exchanges between Greece, Turkey and Bulgaria in the early 1900's. Migrants and minorities[75] are free to declare their ethnic origin, speak their languages, exercise their religion and observe their particular customs and traditions[76].

[75] According to the widely accepted definition of minority adopted by the United Nations, a minority is "a group numerically inferior to the rest of the population of a State, in a non dominant position, whose members –being nationals of the State- possess ethnic, religious or linguistic characteristics differing from the rest of the population and show, if only implicitly, a sense of solidarity, directed towards preserving their culture, tradition, religion, or language" (cited in Rozakis, Ch. (1996). The International Protection of Minorities in Greece. In K. Featherstone & K. Ifantis (Eds.), *Greece in a Changing Europe. Between European Integration and Balkan Disintegration*, Manchester, p. 96).

[76] Ministry of Foreign Affairs: http://www.mfa.gr/en/

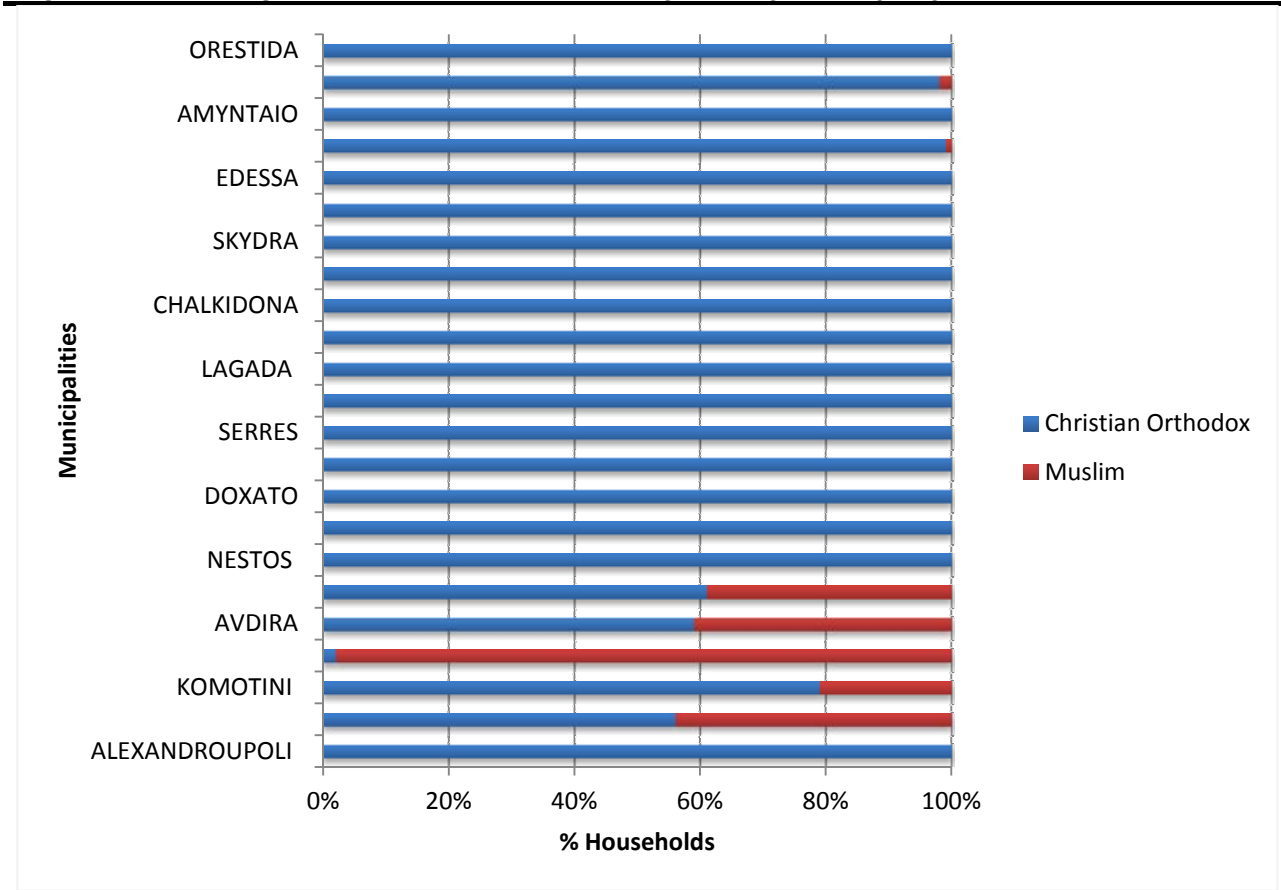
The majority of people in Greece are Greek Orthodox, estimated to be between 95-98%[77] of the population. Other significant religions include other forms of Christianity and Islam. The Muslim minority is the only recognised religious minority in Greece. In Thrace there are about 270 imams, 300 mosques and three "Muftis", one in each of the three prefectures of Thrace. The "Mufti" is appointed by a body of prominent members of the Muslim community and seen as the supreme Muslim authority in religious and spiritual matters. Key informants and focus groups with Muslim community members indicated that the Mufti was strictly used for religious matters, however, in one case (in the settlement of Koptero) the Mufti took an active role in the community meeting, exerting influence on public opinion.

There are no official data concerning the exact number of Muslims in Greece and since 1951 the censuses has not included questions on religion or language[78]. However, the Muslim population of East Macedonia – Thrace, is estimated to be between 140,000 – 145,000 people[79].

Muslims are not excluded from any political process and they can be elected, like all Greek citizens, into every political office (mayors, members of municipal councils, members of local councils etc), as is evident in today's parliament where there are 3 Muslim deputies[80]. Within the study area large Muslim populations can be found in the municipalities of Iasmos, Maronia – Sapes, Avdira, Topiros and Komotini[81]. In Kastoria 2% of surveyed households were Muslim while in Skydra and Eordea only 1% was reported. The municipality of Iasmos, where 98% of the surveyed population are Muslim, there is a Muslim Mayor and in the municipality of Avdira (41% Muslim population) the Mayor and all members of the Municipal Council are Muslim. After Kallikratis, the political position of these local elected administrators has been strengthened as a result of the merging of small communities in larger municipalities[82]. As stated by Muslim key informants and focus groups, the Muslim population coexists with the Christian majority and they are fully integrated into Greek society. The figure *Figure 6-96* below presents information on religion taken from the household surveys.

[77] CIA World Factbook 2010
[78] Kotzamanis, B. (2011). Population Censuses in Greece. DemoNews, March-April 2011, Issue 14, Available at: http://www.ldsa.gr/
[79] Region of East Macedonia and Thrace
[80] http://www.hri.org/news/greek/misc/96-04-06.mgr.html
[81] RDA's Innovation Action Plan 2020. Available at: http://www.veda-bg.eu/
[82] Anagnostou & Triandafyllidou, op.cit.

Figure 6-96 Religion in the Socioeconomic Study Area by Municipality



Source: Household Survey for the TAP Greece ESIA (2011 and 2013)

The Muslim population of East Macedonia - Thrace includes two special cultural groups, the Roma and the Pomaks. The Pomaks (literally meaning "people who have suffered") are generally considered a Slavic Muslim population. The exact origin of the Pomaks is disputed, but they can be found in various countries of the Balkan region of southern Europe, such as Bulgaria, Greece, Turkey, Albania, Republic of Macedonia and Kosovo. Almost all of the Roma groups identified in the study area are also Muslim, unlike Roma in other parts of the country who generally profess the Christian religion[83]. Further information on the minority groups of Pomaks and Roma can be found in *Box 6-9* and *Box 6-10*, respectively.

[83] Zeginis, E. (1994). *Muslim Roma of Thrace.* Institute for the Study of the Aimos Peninsula. Thessaloniki.

Box 6-9 The Identity of the Pomaks

Pomaks: According to the 2001 census, 36,000 Pomaks inhabited East Macedonia – Thrace (23,000 in Xanthi's prefecture, 11,000 in Rodopi prefecture and 2,000 in Evros prefecture). In the study area, some Pomak population inhabits the settlements of Fylakas (municipality of Komotini), Galini, Koptero and Amaxades (municipality of Iasmos), Vafeika, Feloni and Tektonas (municipality of Avdira) and Vaniano (municipality of Topiros). Data from a focus group with Pomaks conducted in the settlement of Amaxades, indicate that although the Pomak population traditionally inhabits the high mountainous areas of East Macedonia - Thrace, currently some communities have moved to lowland areas. Most Pomaks in the study area are occupied in agriculture, especially in the cultivation of tobacco and livestock breeding, while some are sailors[84]. Pomak communities reported that they maintain very close relations with each other but there is no distinct leadership.

Pomaks are primarily defined by their language and religious faith (Islam)[85], although they refer to themselves in several different ways. Some Pomaks prefer to be called "Greek-Pomaks" or "Greek Muslims", whilst others think of themselves as "Greek citizens of Turkish origin" or descendants of ancient Thracian tribes[8687]. According to some references[88], most Pomaks deny this self-identification in the presence of outsiders, which was confirmed during the field study. It is believed that the main reason for this is to assimilate into local society and the feeling that the Pomak identity has become a labelling that confers the lower status of "a minority in a minority" (the muslim one). There is concern that this perception is an obstacle to the preservation and development of the Pomaks' traditions and cultural identity[89].

All of the Pomaks interviewed believe they face the same problems as other inhabitants in the settlement. Among these problems they mentioned lack of funding from the municipality, lack of medical services and lack of infrastructure in general (e.g., flood protection, transportation network etc). According to key informants interviewed during the field study, the Pomak community is fully integrated into local communities and do not face any problems with discrimination. Interviewees perceived that minorities sometimes receive preferential attention, something they considered unfair, since "all local people face similar problems that must be addressed".

Source: Field Survey for the TAP Greece ESIA, 2013

[84] Focus Group Pomaks, ASPROFOS, 2013.
[85] Kokkas, N. (2007). Tradition vs. Change in the Orality of the Pomaks in Western Thrace - The Role of Folklore in Determining the Pomak Identity. In K. Steinke & C. Voss (Eds.) *The Pomaks in Greece and Bulgaria. A Model Case for Borderland Minorities in the Balkans.* München: Südosteuropa-Gesellschaft- Verlag Otto Sagner, pp. 75-114.
[86] Theocharidis, op. cit.
[87] Geitler L. (1878). Poeticke Tradice Thraku i Bulharu. V Praze.
[88] See http://historyofthrace.wordpress.com/
[89] Malkidis, T. (2002). Pomaks in Thrace. Communication in the International Conference *"Space and Environment: Globalization,Viablitiy*". Athens, Panteio University, March 9-10, 2002.

Box 6-10 The Identity of the Roma

Roma: Roma people are not composed of a single homogenous ethnic group[90]. It is reported that there are between 250,000-300,000 Roma in Greece[91] scattered throughout the country, although larger populations are found in the areas of Attica and Thessaloniki[92]. 17.3% of the Roma population in Greece live in East Macedonia – Thrace and 14.2% in Central Macedonia[93]. The nomadic way of life has largely been abandoned by Roma in favour of an urban lifestyle. Roma communities in Greece face several problems including high instances of child labour, low school attendance and problems with the law. The majority of Roma are occupied in the agricultural sector, selling their produce in local stalls and street markets[94], or just "taking a car with a sample of their products and going around selling it"[95].

In the study area, some Roma populations exist in the municipalities of Iraklia (25 households), Alexandroupoli (1,500), Komotini (400), Xanthi (1,200), Nestos (173) and Maronia – Sapes (210)[96]. A small Roma camp is also located close to Nea Mesimvria settlement in Central Macedonia, with population numbers unknown. A seasonal Roma camp is located in Pella municipality.

Focus group meetings with Roma in the municipalities of Serres and Alexandroupoli found that the nomadic life still continues for some, but not necessarily out of choice. Participants stated that they have had to leave an area due to quarrels with other Roma groups ("they hit us because we did not allow our daughter to be engaged with one of them") and that they are looking for a place to live more permanently. The members of a Roma group interviewed in Mitrousi (municipality of Serres) evaluated their life quality as "'Very bad. We are cold during the night, we do not have light, we do not have water, we do not have a bath, we do not have water to wash" and "We want houses to have heat and be clean. We live in the garbage that's why we get sick". Housing is a major problem for these people, since "the locals do not rent us a house because they are afraid that we will not pay the bills". However, as they also said, "we like our village, there are some nice people, the president is good and we do not wish to go away again". Another Roma focus groups in Alexandroupoli stated that discrimination is mainly encountered "from older people, or those who are nationalist", but they also noted that "it's possible but too difficult to create a relationship with a man or woman from the local community" (who is not a Roma).

According to interviewees, local people view Roma as a potential "nuisance" or source of problems, including delinquency, although they did express a degree of empathy, stating "when one's children are hungry, one can do anything to find the means to provide for them". Some heads of settlements seemed highly sensitised to the poor life quality for Roma and have made attempts to reduce public prejudice. Also, people who have co-operated with Roma in local street markets seem to appreciate their trading skills.

Source: Field Survey for the TAP Greece ESIA (2011 and 2013)

The immigrant population in Greece is reported to have shrunk since the economic crisis (though no official estimation is available), as employment of immigrants has contracted by more than 25% since 2010[97]. In total 60% of all settlements in the study area reported having a small percentage (up to 5%) of economic immigrants[98]. Most immigrants in the study area are first

[90] Zachos, D. (2006). Sedentary Rom (Gypsies): The Case of Serres Basin. Paper presented at the *Sixth European Social Science History Conference,* Amsterdam. Available at: http://www2.iisg.nl/esshc/programme.asp?selyear=8&pap=4266.
[91] Hellenic Republic: National Commission for Human Rights: The State of Roma in Greece
[92] http://www.nchr.gr/media/keimena_agglika/GNCHR_Roma_Report_2009.doc
[93] Zarokosta, E. Tzanas, K. & Tseva, A. (2009). *Health and the Roma Community. An Analysis of the Situation in Greece.* Part of the Project "Health and the Roma Community in Europe", Public Health Programme, Cuaderno Tecnico No 91, FSG, Madrid.
[94] National Commission for Human Rights, op..cit.
[95] Roma Focus Group, Alexandroupoli, ASPROFOS, 2013.
[96] National Commission for Human Rights, op. cit.
[97] National Bank of Greece (2012). Economic and Market Analysis, November 2012, p. 6.
[98] Interviews with Heads of Local Communities, 2011 and 2013.

generation Albanians and Bulgarians, many of whom have been in the area for between 15 –20 years and are well integrated in the local societies, they have their families in Greece, they speak Greek and their children attend Greek schools (see *Box 6-11*). However, in a number of municipalities such as Oreokastro, Emmanouil Pappa, Nea Zichni, Amfipoli, Avdira, Komotini, Iasmos, Chalkidona, Eordaia and Korissos it was reported that seasonal immigrants from Albania and Bulgaria are sometimes hired during the high farming season which varies, depending on the cultivated crops (see also *section 6.4.3.2*).

The only municipalities in the study area that did not report any residents of Albanian ethnicity were Maronia-Sapes, Topiros and Nestos in East Macedonia and Pella, Skydra and Naousa in Central Macedonia. This information was further supported by the household survey, which found either none or very few migrants in these areas (4% in Skydra and zero in all other municipalities).

Box 6-11 Economic Immigrants in the Study Area

Economic immigrants in East, Central and West Macedonia primarily come from neighbouring countries such as Albania and Bulgaria. Focus groups held with economic immigrants along the route confirmed that the majority of people who come to Greece for work are unskilled labourers; most of the immigrants in the study area work in agriculture, but a significant minority work in manufacturing and in service jobs such as security and cleaning. Most of immigrants in the study area have been living in Greece for 10 – 15 years, and had brought or started families in the country.

For the most part, Albanian immigrants responded that they utilise the same resources and forms of representation as Greek residents. Residents in Kastoria noted that there is an Albanian Immigrants Association in Argos Orestiko, but that the Albanian community is also happy to go to the community council with any problems. Given the lengthy period of residence for most of the immigrants, language barriers did not seem to constitute a major problem. Albanians interviewed in the more mixed economies throughout the study area reported that most immigrants had attended secondary school; in contrast, immigrants in the heavily agricultural municipalities where there are higher numbers of seasonal migrants thre is a higher illiteracy rate among permanent immigrants, it is likely that these groups are less able to utilise available resources and may be less well integrated into the community.

The cases of discrimination or exclusion raised by the focus groups were minor - one group mentioned cases of difficulty renting houses and another mentioned the nuisance of having to renew residency permits every year. Anecdotal evidence of lingering prejudice and protectionism among the Greek population (jobs for Greeks first) was apparent in isolated instances.

ERM (2011) and ASPROFOS (2013)

The settlement of Neos Zygos in the municipality of Kavala is inhabited solely by Greek immigrants repatriated from Georgia following the break up of the former USSR. Further information on immigrants from Georgia in the study area, can be found in *Box 6-12.*

Box 6-12 Immigrants from Georgia in the Study Area

After the disintegration of the former USSR at the beginning of the 1990s, more than 20.000 people from Georgia came to Greece[99] and most of these people reside in Macedonia. Georgian Greeks are primarily occupied as domestic employees, construction workers, workers in manufacturing industries, or as employees in hotels and restaurants. As confirmed by focus group participants, many families from Georgia left Greece after the crises, due to unemployment and poverty.

The settlement of Neos Zygos (Prosfyges) in the municipality of Kavala, is a local community of repatriated Greeks who arrived 20 years ago from Georgia through a repatriation program. Residents reported that local authorities promised homes and facilities to migrants but most only received a small loan (50,000 drachmas). The participants expressed their frustration over what they perceive as "a late response" on the part of the authorities. Currently, 40 families in the settlement still live in small prefabricated houses. The settlement is the only one in the study area with no asphalted road and even the church of the settlement is prefabricated. According to the participants, the soil in the settlement is infertile and since local industries have shut down there is a major issue with unemployment.

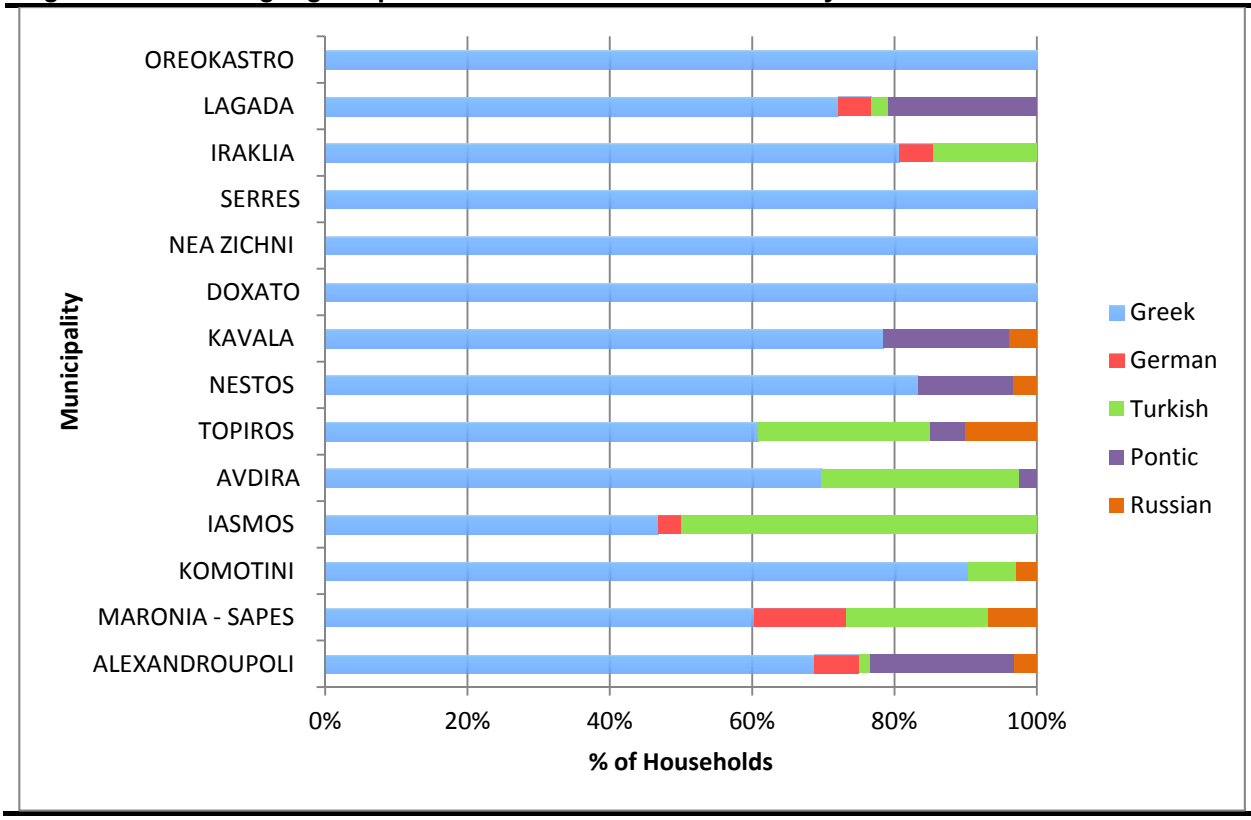
Georgian immigrants in Aetochori (municipality of Alexandroupoli) have a different profile, as the majority of them are skilled or have finished University in Russia, which implies more employment opportunities. However, as reported by focus groups, unemployment remains a problem and for those that find a job, working conditions are poor (there is no fixed agreement regarding the amount of hours they have to work per day). Despite that, participants evaluated their life quality as better than in Georgia where they used to live. Furthermore, the participants stated that "they feel they are home again", they love Greece, and they like the interaction with other people in the settlement, but they sometimes face discrimination from older local people or their children face discrimination in school.

Source: Field Survey for the TAP Greece ESIA (2013)

A variety of languages and dialects are spoken in the study area, including Turkish, Pontic Greek, Armenian, German, Russian, Bulgarian Albanian and Romanian. All respondents in 13 of the 23 municipalities that household surveys were conducted reported Greek as their mother tongue. A language other than Greek as the mother tongue was reported in the remaining 10 municipalities of the study area, the lowest reported in Skydra (2%) and the highest in Iasmos (70%). *Figure 6-97* and *Figure 6-98* present the main languages spoken, in households within the study area.

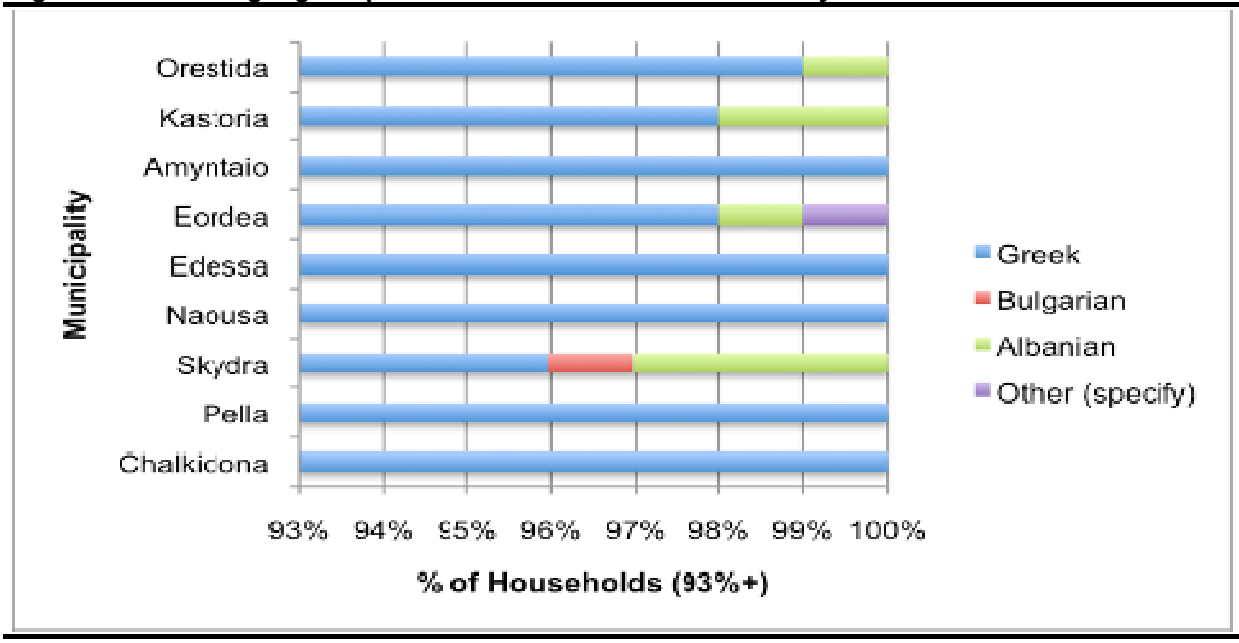
[99] Triandafyllidou, A. Maroufof, M & Nikolova, M. (2009). Greece: Immigration towards Greece at the Eve of the 21st Century. A Critical Assessment. IDEA Working Papers, No 4, March 2009.

Figure 6-97 Languages Spoken in the TAP Greece East Study Area



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-98 Languages Spoken in the TAP Greece West Study Area



Source: Household Survey for the TAP Greece ESIA (2011)

Turkish and Pontic Greek are the main second languages spoken in the study area. Turkish is spoken in the municipalities with Muslim populations, mainly Iasmos (15% of surveyed population) and Avdira (13%), whilst Pontic Greek is prevalent in Alexandroupoli (14%), Kavala (13%) and Lagada (9%). Very few household survey respondents speak European languages.

The majority of Roma living in Western Thrace speak a dialect of the 'Vlachoura-Roma' language in addition to Greek[100], whilst most Pomaks speak the Pomakic dialect[101] fluently, as well as Greek and Turkish, in addition to some Arabic (the language of their religious services)[102]. During the field study it was reported that most Pomaks avoid using their language in public places, however, they do speak Pomakic at home. The use of the Pomakic language to communicate with other Pomaks in public places is mainly a sign that the “others” (the non members of the group) are unwanted in the specific conversation.

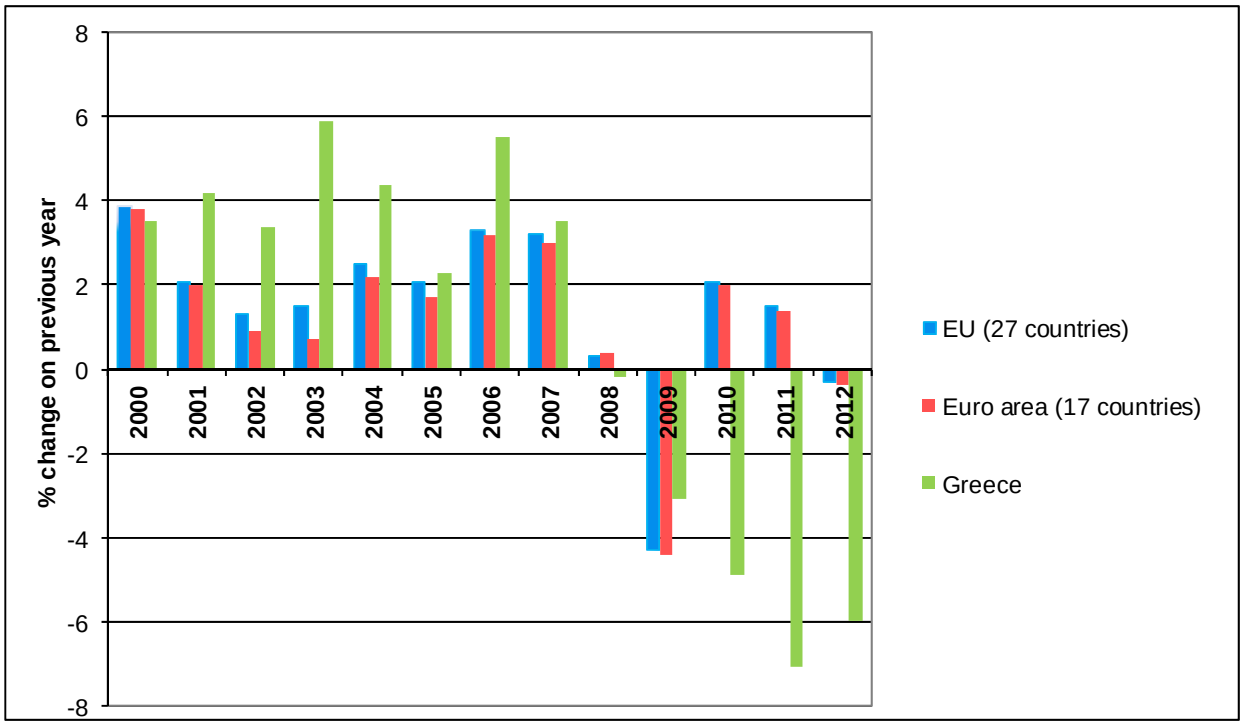
6.4.4 Economy, Employment and Income

6.4.4.1 National Overview

Until 2008 Greece had experienced strong economic and GDP growth; over the preceding 15 years these economic indicators were generally higher than the average for EU countries. Following the economic crisis in 2008 the Greek economy went into recession and the economy contracted by 2% in 2009 and a further 4.8% in 2010. Between 2010 and 2011, GDP rates in other EU countries have managed to recover to some degree, whilst Greece continued to see negative GDP growth. This decline in GDP was driven by a reduction in export goods as well as a fall in both consumption and investment, the latter dropping by more than 20% in 2011[103]. In 2012 Greece continued to see negative GDP growth, although slightly less than in 2011, which may be due to the EU, ECB and IMF interventions. *Figure 6-99* presents information on GDP in Europe between 2000-2012.

[100] Hellenic Republic: National Commission for Human Rights: The state of Roma in Greece
[101] The Pomakic dialect belongs to the broader group of Slavic languages of the southern Balkan peninsula. Major differences exist among the various local dialects, according to the area of inhabitance of the Pomaks, (e.g., in the east part of Thrace the language has been influenced by the Turkish language, in the western part it has been influenced by the Bulgarian language, while it also includes many Greek words as well (Theocharidis, 1995).
[102] [102] Report on the Pomaks, by the Greek Helsinki Monitor.
[103] National Bank of Greece (2012). Summary of the Annual Report, April 2011.

Figure 6-99 Real GDP Growth Rate; 2000-2012



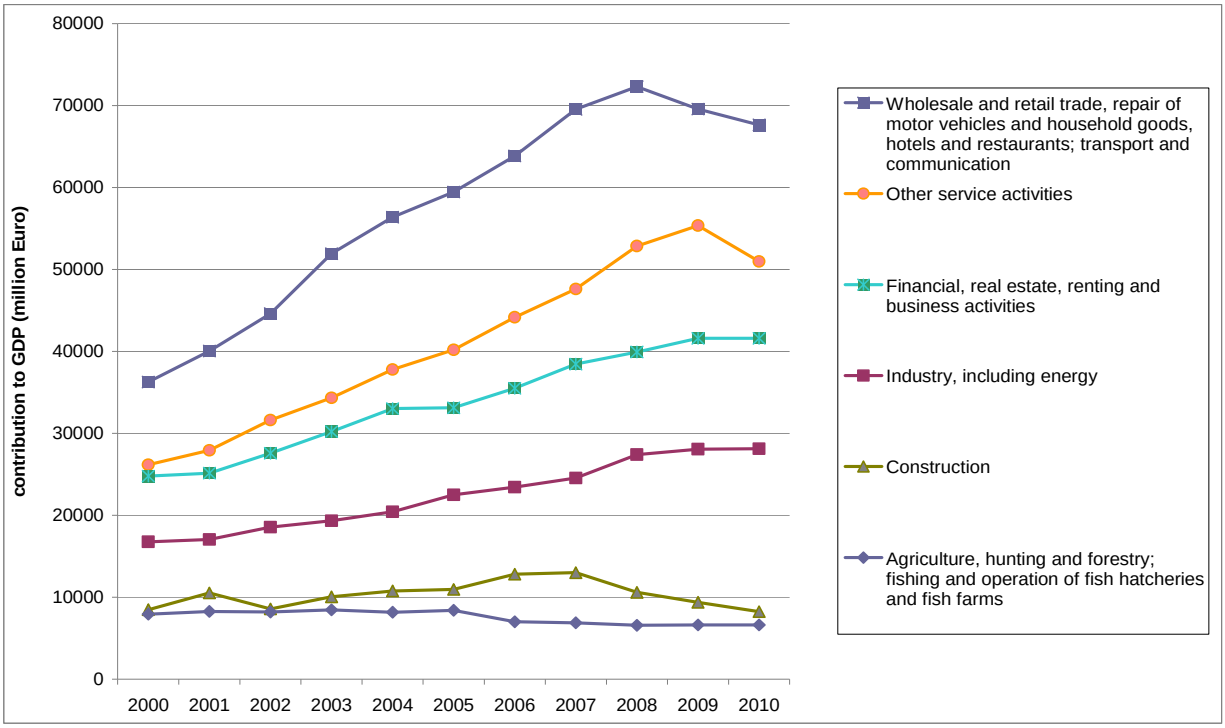
Source: Eurostat, Economy and Finance, National Accounts 2000 -2012.

In 2010, the Greek government implemented an austerity program in order to reduce long-standing inefficiencies in the economy. Measures have included minimising public sector and government spending and reforming the health care and pension system, which has affected a large proportion of the population. Nonetheless, the Greek economy continues to face a dual challenge, of restoring fiscal sustainability and reversing its economic losses of previous years[104]. According to the most recent data, public debt and unemployment are above the euro-zone average, whilst inflation is below[105].

The Greek economy is heavily reliant on services (including hotels and restaurant, transport and communication, etc.), which accounted for 59% of the gross value added in 2010, followed by financial, real estate, renting and business activities (20%) and industry, including energy (13%). Agriculture and construction contribute least to the overall national economy (3% and 4%, respectively) (Figure 6-100)

[104] National Bank of Greece (2012). Economic and Market Analysis, November 2012.
[105] This controversy has an obvious explanation: people in Greece, heavily affected by the austerity measures, abstain from any unnecessary transactions and stick to the necessary ones, thus the inflation rates remain low (0.3%).

Figure 6-100 Contribution of Major Sectors to Greek GDP 2000 – 2010



Source: Hellenic Statistical Authority (2011)

In 2009, the Gross Regional Product (GRP) of Central Macedonia represented 15% of Greece's total Gross National Product (GNP)[106], while East Macedonia – Thrace accounted for 3.9%[107] and West Macedonia for 2.3%.. The economic structure of the three regions is similar to Greece as a whole with a trend towards growth in the services sector and decline in industry and agriculture. Services now account for the majority of GRP in all three regions, highest being in Central Macedonia (74.5%), followed by East Macedonia-Thrace 72.1% and last West Macedonia (61%). The second largest contributor to all three regional economies is industry, which is higher in West Macedonia (33%) than East Macedonia-Thrace (22.3%) and Central Macedonia (21%). This is due to the presence of the mining and energy industry in the municipalities of Eordaia and Amyntaio, mainly in the area of Ptolemaida town, Pentavrussos, Perdikkas, Galateia and Drosero settlements. Agriculture represents less than 6% of GRP in all regions, accounting for just 5.6% in East Macedonia – Thrace, 4.5% in Central Macedonia and5.1% in West Macedonia. .

[106] Gross National Product (GNP) is the market value of all final goods and services produced by a country domestically and abroad in a given period. Gross Domestic Product (GDP) is the market value of all final goods and services produced within a countries national borders, both national and international, within a given period.

[107] REGIONAL ACCOUNTS: 2009 (provisional data). Press Release, 31-03-2011. Regional Accounts of 2010 will be disseminated to the public in a press release in 2013.

The regional economy of Central Macedonia represents approximately one fifth of all national exports and Thessaloniki is home to more than 70,000 industrial, craft and commercial businesses, including an oil refinery, tobacco factories, chemical plants and steel mills and contributes 65.2% to Central Macedonia's GRP.

The proportion of the economically active (15-64 years) population in Greece is consistently lower than the EU average. Although this proportion increased during the period 1998-2011 from 63.2% to 67.7%, it still remained lower than the European average of 71.2% in 2011[108]. Part-time employment in Greece is also substantially lower than the EU-27[109] average. At 6.8% of total employment, it remains almost 14 percentage points lower than the Euro area average of 20.9% in 2011[110].

According to Eurostat data, in 2011 Greece experienced one of the highest increases in unemployment among the EU-Euro zone countries, reaching 18.3% in August[111]. The decline in production was the main cause of the net loss of 298,000 jobs and the surge in unemployment by approximately 248,000 people[112]. In 2012, Greece had the highest unemployment rates in the Euro area and in the EU-27 area[113]. As shown in *Table 6-112*, unemployment is particularly high among young people (those below age 25).

Table 6-112 Employment Data for Greece (2007-2011)

	2007	*2008*	*2009*	*2010*	*2011*
Employment rate - % working age population (15-64)	61.4	61.9	61.2	59.6	55.6
Employment rate (% population aged 15-24)	24.0	23.5	22.9	20.4	16.3
Employment rate (% population aged 25-34)	74.9	75.6	75.0	71.4	64.7
Employment rate (% population aged 55-64)	42.4	42.8	42.2	42.3	39.4
Unemployment rate (% labour force)	8.3	7.7	9.5	12.5	17.7
Youth unemployment rate (% labour force 15-24)	22.9	22.1	25.8	32.9	44.4
Long term unemployment rate (% labour force)	4.14	3.64	3.86	5.64	8.8

Source: Eurostat, General and Regional Statistics, Regional Labour Market Statistics. Last update: 04-07-2012.

[108] Eurostat, General and Regional Statistics, Regional Labour Market Statistics, Last update 04-07-2012.
[109] EU27 refers to the 27 member states that make up the European Union. EU 17 represents the 17 countries that are part of the single currency the Euro.
[110] Eurostat, General and Regional Statistics, Regional Labour Market Statistics, Last update 07-02-2013.
[111] Eurostat, Euroindicators, November 2011 http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/3-30112011-BP/EN/3-30112011-BP-EN.PDF
[112] National Bank of Greece (2012). Summary of the Annual Report, April 2011.
[113] Eurostat, General and Regional Statistics, Regional Labour Market Statistics, Last update: 14-01-2013.

In addition, Greece has one of the lowest transition rates (<0.5%) from temporary to permanent employment and from unemployed to employed together with Belgium, and Italy[114]. Inter-sectoral employment search is traditionally poor in Greece, however, recent data indicates that the recession has caused this to increase to unprecedented levels[115]. People with a higher level of education (tertiary degrees) appear to be more resilient to the crisis due to their ability to search for work between sectors, as the unemployment rate in this population is significantly lower than the rest of population (14% versus 25.6% in 2012)[116]. However, this is often at a cost to wages, which have seen significant reductions due to new employment contracts.

6.4.4.2 Economic Activities in the Socioeconomic Study Area

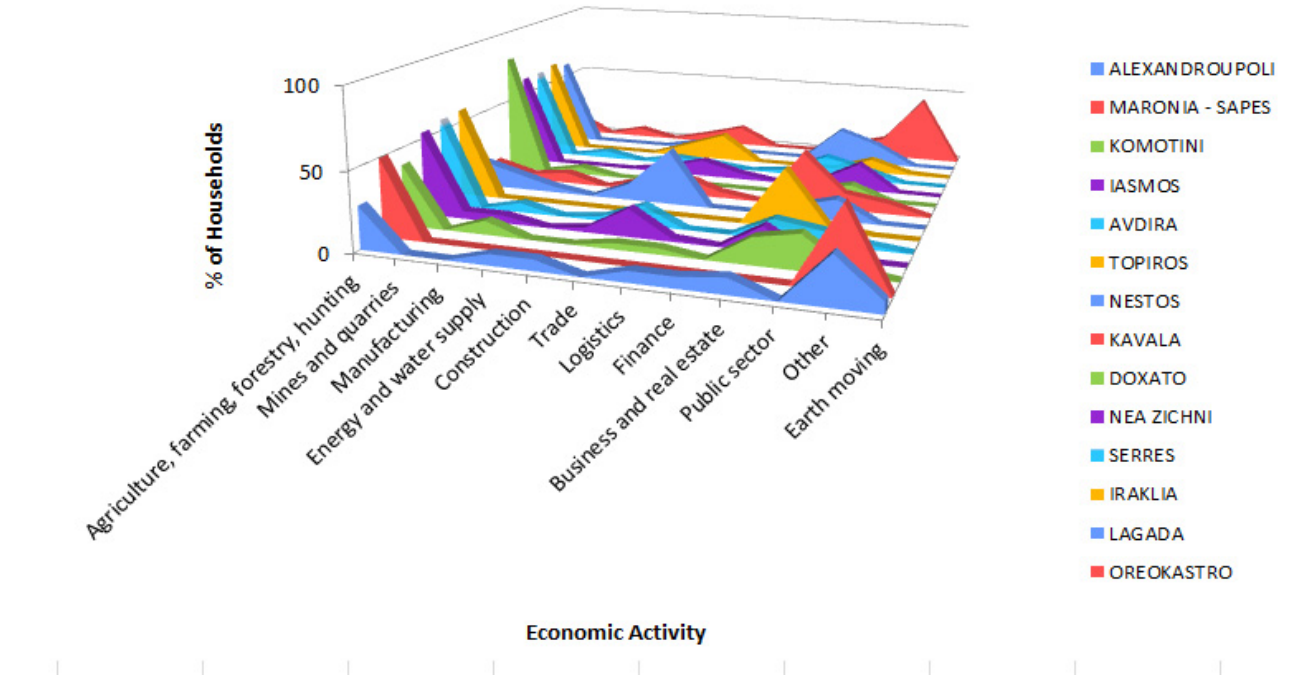
According to Eurostat (June 2012) the service sector is the largest employer in East Macedonia-Thrace, Central Macedonia and West Macedonia (57,1%, 66,6% and 55% respectively), followed by industry in Central and West Macedonia (22%, and 28%) and agriculture (11%and 16%). In East Macedonia-Thrace the second largest employer is agriculture (25%) followed by industry (16%) The socioeconomic study area is considerably more rural than the regions as a whole and although municipality economies are mixed, agricultural production together with animal husbandry are the dominant activities.

The study area of Central Macedonia in TAP Greece East is purely agricultural, with the exception of settlements that are closer to Thessaloniki (municipalities of Oreokastro and Chalkidona). This is a similar profile throughout the Eastern section of the socioeconomic study, with agriculture being the dominant activity, but mixed economies found in municipalities located close to the industrial and urban areas of the cities of Kavala, Xanthi, Komotini and Alexandroupoli. In East Macedonia – Thrace, agriculture represents over half of the economic activity in Topiros (58% of those employed) and Iasmos (54%) and a significant proportion in Maronia – Sapes (50%), Advira (47%), Komotini (39%), and Alexandroupoli (27%). In the study area of Central Macedonia in TAP Greece East, surveyed households in the municipality of Doxato reported the higher proportion of people employed in farming, forestry or hunting (80% of those employed), followed by Iraklia (63%), Serres (61%), Nea Zichni (61%) and Lagada (59%). Nestos, Oreokastro and Kavala are the only municipalities in TAP Greece East where agricultural

[114] Eurostat, General and Regional Statistics, Regional Labour Market Statistics. See also, European Comission (2010). Employment in Europe.
[115] National Bank of Greece (2012). Economic and Market Analysis, November 2012, pp.6-7.
[116] National Bank of Greece (2012), op. cit.

production is not the biggest contributor to the economy (just 18%, 13% and 11% respectively). *Figure 6-101* presents the household survey findings on economic activities in TAP Greece East.

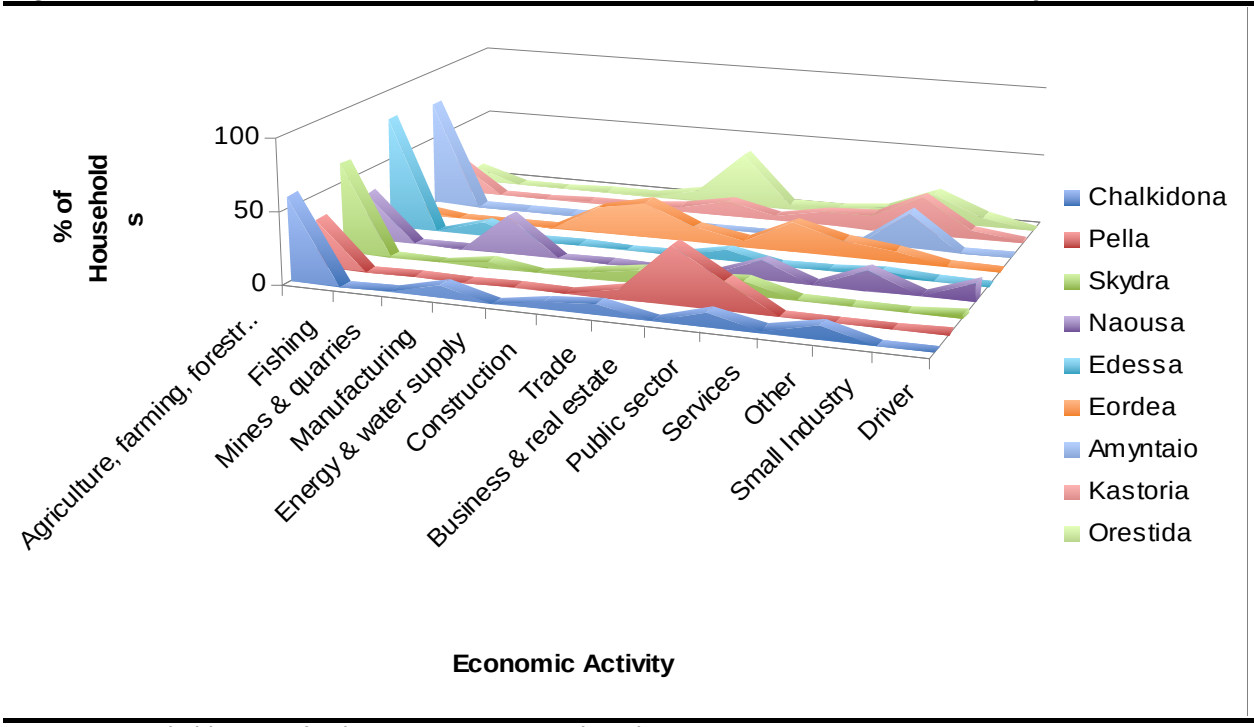
Figure 6-101 Economic Activities in the Socioeconomic TAP Greece East Study Area



Source: Household Survey for the TAP Greece ESIA (2013)

Municipalities in Central Macedonia in TAP Greece West have the highest proportion of surveyed households engaged in agricultural production. In Edessa 79% of surveyed households engage in farming or forestry, followed by Skydra (60%), Chalkidona (56%) and Pella (31%). Fewer households surveyed in West Macedonia reported agricultural production as the main economic activity with Amyntaio being the only municipality where agriculture represents a significant economic contributor (75%). *Figure 6-102* presents the findings from the household survey on economic activities in TAP Greece West.

Figure 6-102 Economic Activities in the Socioeconomic TAP Greece West Study Area



Source: Household Survey for the TAP Greece ESIA (2011)

All settlements in the socioeconomic study area (TAP Greece East and TAP Greece West) reported undertaking several economic activities in addition to agricultural production. Some settlements are more reliant on one or two activities, but in general a range of activities can be found in almost all municipalities. Examples of the activities undertaken throughout the socioeconomic study area are presented in *Box 6-13*.

Box 6-13 Examples of Economic Activity in the Socioeconomic Study Area

Trade: Local trade represents wholesale and retail shops selling various products (e.g., agricultural and fishery products, construction materials etc), as well as small businesses and coffee shops. One or more coffee shop is found in every village, regardless of size, as they are a central feature of village life, an important meeting point and focus for social interactions between locals. In addition to the general stores, several settlements have specialised shops selling renowned products, such as the famous pastry stores in Nea Karvali. Some form of trade can be found in most settlements (even if it is just a coffee shop). Trade is an important sector of employment for most larger settlements, as well as settlements that are located close to the urban centres of the study area and a proportion of their population is engaged in trading activities in these centres. This is reflected in the findings from the household survey where respondents in the municipality of Nestos (East Macedonia-Thrace) stated that trade is the most important economic activity (36% of those employed), with most trading activities taking place in the city of Kavala. Trade is also significant in Iasmos, Kavala, Avdira (East Macedonia-Thrace), Iraklia, Oreokastro and Nea Zichni (Central Macedonia), representing between 11%-18% of those employed.

Public Sector: Employment in the public sector (which includes work in local government, public utilities and construction, but also services such as teachers, health workers etc) is a significant economic activity for the municipality of Komotini and Nea Zichni, where it represents the second most important economic activity (22% and 18% of those employed, respectively). A proportion of the population of these settlements are employed in in the nearby urban centres (Kavala, Komotini and Serres) as well as in the large settlement of Nea Zichni A significant minority of respondents working in the public sector whre also reported in Eordea (21%), Pella (19%), Naousa (14%) and Kastoria (11%) (the Eordea numbers may have been slightly overstated as work for the state-run power company was sometimes reported as public sector). Alexandroupoli, Maronia-Sapes and Iasmos in East Macedonia-Thrace, Edessa in Central Macedonia and Amyntaio in West Macedonia are the only municipalities that did not report any respondents working in the public sector.

Mines and Quarries: Employment in mines and quarries was reported in the municipalities of Nestos (11%) and Iasmos (5%). In the wider area of East Macedonia – Thrace and especially in Kavala, there are rich reserves of metallic minerals, hydrocarbons, aggregates, schist and marble. The marble quarries of Kavala cover almost 40% of total marble production in Greece. Further information on mines and quarries is presented in section 6.4.4.6 below.

Energy and Water Supplies: Photovoltaic parks (solar panelling) are scattered throughout the wider study area and even more prevalent in the region of East Macedonia – Thrace. During community discussions in the settlement of Feloni in Avdira municipality, it was reported that in the municipality of Avdira, a proportion of surveyed households (6%) work within the field of photovoltaics or have invested in private photovoltaic installations.

Manufacturing: Manufacturing is primarily undertaken in specifically designated industrial areas It is thethe main economic activity for small proportions of household respondents in several municipalities in the study area, with the largest proportions found in the municipality of . The industrial areas in Komotini and Kavala in East Macedonia-Thracemanufacture a wide range of products, including food, timber, plastic, textile, tobacco industry, fertilizer and metalworking. Additional information on these industries is included in *section 6.4.4.6* below. In West Macedonia until the late 1990's the fur industry was thriving and employed many people, especially in Kastoria. However, the industry has been in decline, due to competition from countries in Asia and fur manufacturing now represents 6% of the economic activity undertaken by surveyed households in this municipality.

Business & Real Estate: Surveyed households in the municipality of Pella reported business and real estate as the most significant economic activity, which represents 36% of all households. Surveyed households involved in small business can also be found in Skydra (6%), Edessa (7%), Eordea (4%), Kastoria (2%) and Orestida (3%).

Source: Household Survey for the TAP Greece ESIA (2011 and 2013)

A large proportion of the surveyed population within the socioeconomic study area is not actively engaged in any economic activity, as they are either retired, housewives, studying, or unemployed. Approximately a third of the female population in East Macedonia-Thrace, Central Macedonia and West Macedonia is employed and between 17% and 3% of all household survey respondents were housewives.

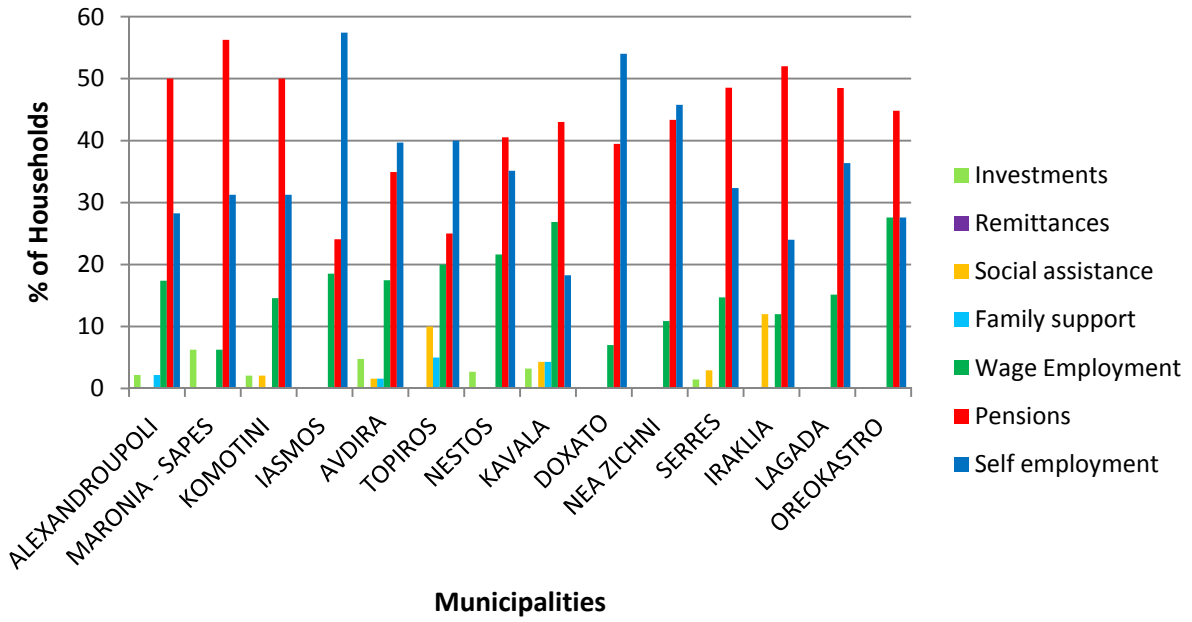
In TAP Greece East, retired households account for between 16%-64% of those surveyed, with figures corresponding to settlements reporting a high proportion of residents over the age of 60. This is evident in Maronia - Sapes, where 64% of household survey respondents reported being retired and over a quarter of the population is over 61 years of age. In TAP Greece West retired households account for between 15%-40% of those surveyed. In Edessa, where 40% of household survey respondents reported being retired, over a quarter of the population is over 65 and 53% of household survey respondents reported being over 65.

After the significant cuts in pensions and social services during 2011-12, retired households are more prone to poverty. The economic characteristics of the socioeconomic study area along the route are summarized in *Figure 1-1* and *Figure 1-2* in *Section 1.2* of *Annex 6.3*.

6.4.4.3 Income Sources and Poverty

The type of income sources found in the socioeconomic study area in TAP Greece East correspond with occupational status; the majority of surveyed households across the route reported reliance on income from pensions (24% - 56%), followed by self-employment (18%-57%) - predominantly in farming- and waged employment (6%-28%) The figure below presents information on the range of income sources reported by surveyed households in the TAP Greece East study area and the percentage of households reliant on each source.

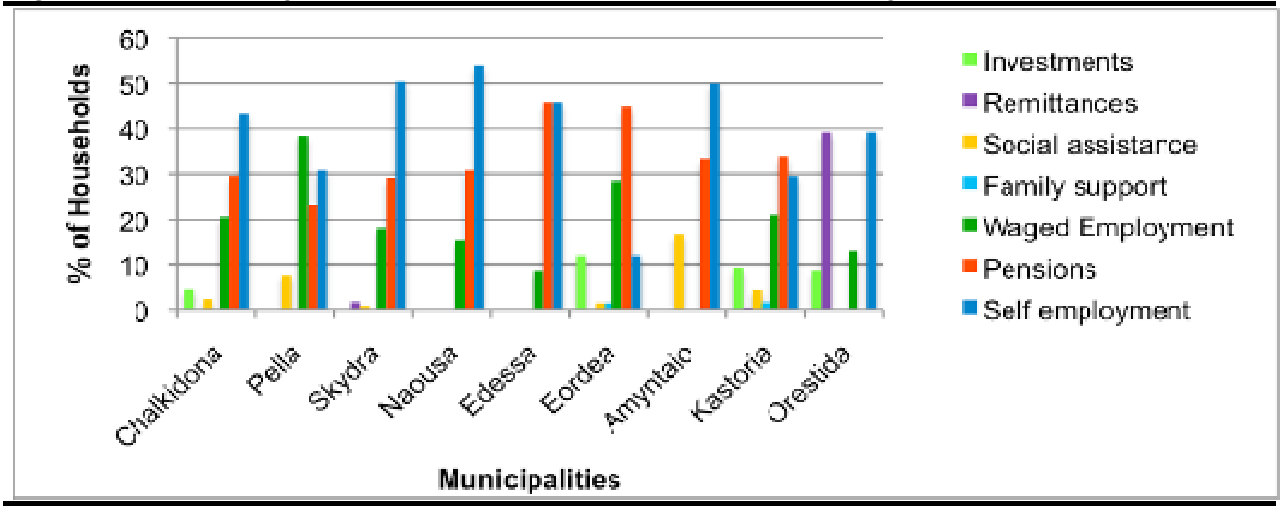
Figure 6-103 Primary Income Sources in the TAP Greece East Socioeconomic Study Area



Source: Household Survey for the TAP Greece ESIA (2013)

In the socioeconomic study area in TAP Greece West, between 20% and 84% of households are reliant on more than one source of income. The highest number of surveyed households reporting reliance on a single income source are in Pella (80%) and Amyntaio (75%). In contrast, in Edessa and Skydra 84% and 82% of surveyed households reported more than one income source. The type of income sources found in the socioeconomic study area correspond with the economic activities undertaken; the majority of surveyed households across the route reported reliance on income from self-employment (29%-54%), predominantly in farming, followed by pensions (23% - 46%) and waged employment (9%-38%). *Figure 6-104* presents information on the range of income sources reported by surveyed households in the socioeconomic study area and the percentage of households reliant on each source.

Figure 6-104 Primary Income Sources in the TAP Greece West Study Area



Source: Household Survey for the TAP Greece ESIA (2011)

Social assistance plays a small to moderate role in household incomes in the study area. Social assistance in Greece is administered at the local level under the supervision of the Ministry of Labour, Social Insurance and Social Welfare[117]. Social assistance provisions include cash benefits, as well as benefits in kind and personal social services. Each municipality runs a social services department, which bears responsibility for the implementation of welfare programmes in the area. Social services are also provided in local communities through a network of voluntary bodies, charitable associations, the Orthodox Church and NGOs. Unemployment allowance is provided to people who meet specific criteria including the number of days that they have been employed. It is provided on a monthly basis and is €359 per month. In the case of dependent family members, the allowance is increased by 10% per family member. Generally, social assistance benefits in Greece are low and do not guarantee adequate living standards[118].

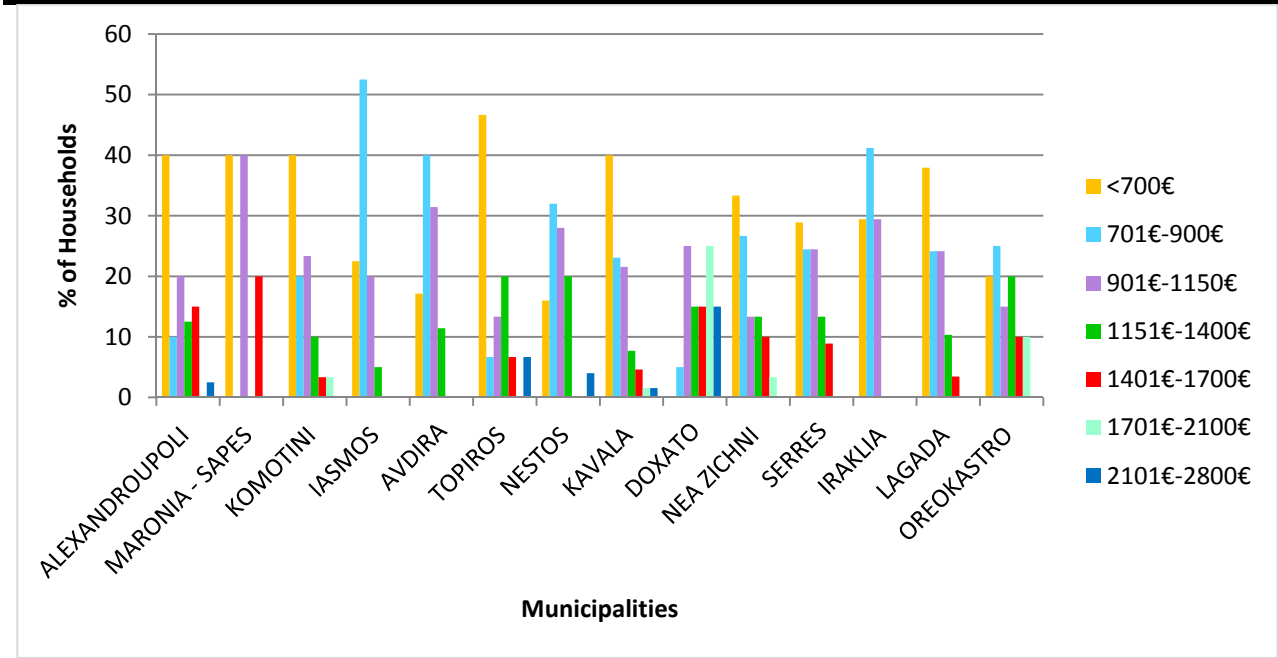
In Central Macedonia, the municipality of Iraklia has the highest proportion of surveyed households receiving social assistance (12%) followed by Pella (8%), whilst a smaller proportion was recorded in the municipality of Serres (3%). It was reported during a women's focus group in Iraklia that the soil in the area is infertile and farmers can only make a very small profit from their activities. Amyntaio in West Macedonia has the highest proportion of households receiving social assistance (17%) followed by Kastoria (4%). However, only 1 surveyed household in Eordea (3%) and 2 surveyed households in Kastoria (1%) reported being solely reliant on social assistance. In East Macedonia – Thrace, the highest proportion of households receiving social

[117] Until 2012, welfare policies were monitored by the Ministry of Health and Social Solidarity.
[118] Matsaganis, M. (2000). Social Assistance in Southern Europe: the Case of Greece Revisited. Journal of European Social Policy, Vol 10 (1): 68–80.

assistance is found in the small rural settlements of Topiros municipality (10%). Smaller proportions were also reported in other municipalities of East Macedonia – Thrace, including Kavala (4%), Komotini (2%) and Avdira (2%). Remittances play little-to-no role in the incomes of households in the study area, with zero households reporting remittances as a source of income in 24 out of 26 municipalities; only 2% of households in Skydra and 1% in Kastoria listed remittances as an income source.

In TAP Greece East, the majority of surveyed households (55.8%) reported a total income of up to €900 per month with 31.4% receiving up to €700 a month and an additional 24.4% of households reporting an income of between €700 – €900. Those earning above €900 are primarily receiving between €901 - €1,150 a month (22.8%) followed by those earning an income of €1,151 - €1,400 (11.7%). Very few households (7%) reported an income of €1,401 - €1,700 and even fewer (1%) reported an income higher than €1,700. The municipality of Oreokastro presents the highest degree of diversity in terms of income levels, with almost all categories of income being represented in proportions of 10% - 20%. Information on income levels in the socioeconomic study area in TAP Greece East is presented in *Figure 6-105* below.

Figure 6-105 Income Levels in the TAP Greece East Study Area



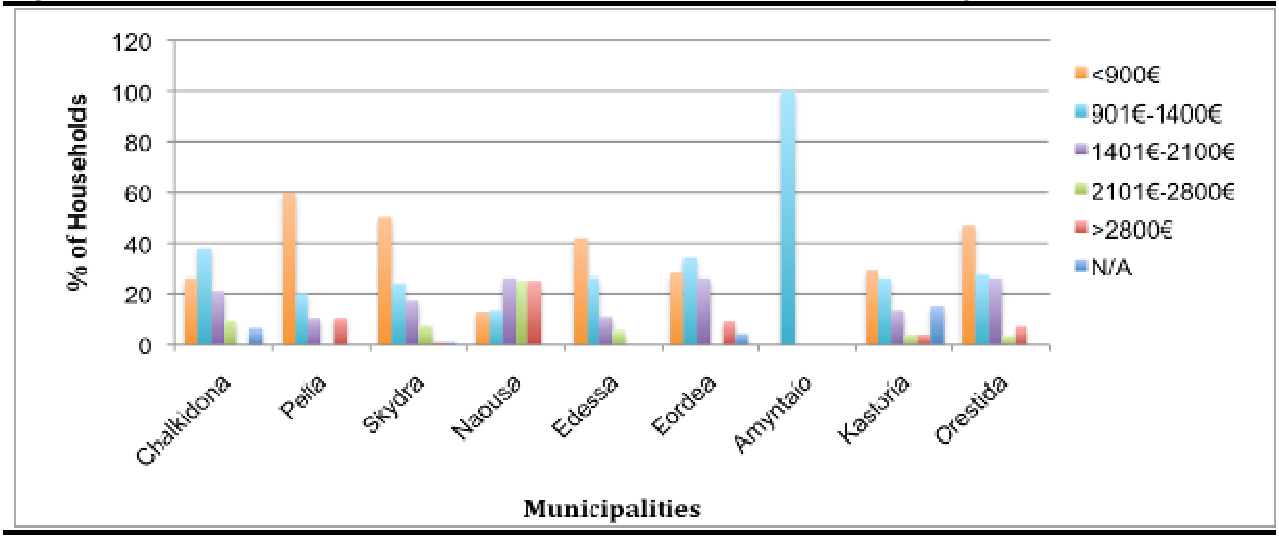
Source: Household Survey for the TAP Greece ESIA (2013)

Household income levels presented above, indicate that lowest income levels were reported by municipalities in East Macedonia-Thrace, including Topiros, Alexandroupoli, Maronia – Sapes,

Komotini and Kavala. However, income related questions were received with a mix of responses and some respondents were suspicious of the questions, which may result in some inaccuracy in the findings on income levels.

In TAP Greece West, total household income amounting to less than €1,400 a month was reported by between 65% and 100% of surveyed households in the different municipalities. The exception to this is Naousa, where half of surveyed households reported earning more than €2,100 a month. In Kastoria 55% of the population are earning less than €1,400 a month, 13% earn between €1,401 and €2,100 a month and 8% earn more than €2,100 a month. Information on income levels in the socioeconomic TAP Greece West study area is presented below in *Figure 6-106*.

Figure 6-106 Income Levels in the Socioeconomic TAP Greece West Study Area



Source: Household Survey for the TAP Greece ESIA (2011)

Low income and high poverty rates are a concerning issue throughout the country, with 21.4% of the Greek population being at-risk-of-poverty in 2011[119]. In the same year, farmers had the second highest poverty rate (55%) after unemployed people (67.4%)[120]. Official figures on poverty rates at a settlement level are not available, however, participants in most focus groups mentioned poverty as a major problem. In Pentalofos (municipality of Oreokastro), participants in community meetings mentioned that some local people occasionally travel to Bulgaria for food supplies, as they can not afford the prices at the local market. Throughout the study area there

[119] ELSTAT, Statistics on Income and Living Conditions, Press Release 2/11/2012. The poverty threshold amounts to 6,591.00 euros per person annually and to 13,842.00 euros for households with two adult and two dependent children under 14 years old.
[120] Matsaganis, M. & Leventi, C. (2011). The Distributional Impact of the Crisis in Greece. EUROMOD Working Paper No. EM3/11.

are a number of informal charitable associations that provide support to community members who are in need. In the municipality of Alexandroupoli and more specifically in the settlements of Agnantia and Pamforo it was reported during community meetings that the broader area has many orphans and single parent families with serious survival problems and some of the residents rely on the help of a nearby monastery ("Panagia of Evros") to provide everyday meals. Furthermore, it is possible that many people living in poverty are embarrassed, meaning the problem is underreported. Indicatively, it was reported by women focus groups that local people who are in need arrange to meet the charity association members in a location outside of the settlement, in order not to be seen by other residents.

6.4.4.4 Employment

Unemployment in East Central and West Macedonia is higher than the national average. *Table 6-113* below compares unemployment in the EU and in Greece, both at a country level and by region.

Table 6-113 Unemployment Rates in the Region

Unemployment Rate	*2007*	*2008*	*2009*	*2010*	*2011*
European Union (27 countries)	7.2	7.1	9.0	9.7	9.6
Greece	8.3	7.7	9.5	12.6	17.7
East Macedonia	9.7	8.7	10.9	14.2	19.9
Male	6.1	4.7	7.6	11.6	17.5
Female	14.9	14.4	15.7	18.0	23.3
Central Macedonia	8.9	8.3	9.9	13.5	19.5
Male	5.4	5.2	7.0	10.1	15.8
Female	14.0	12.8	14.1	18.2	24.5
West Macedonia	12.1	12.5	12.5	15.5	23.2
Male	8.0	8.0	9.5	12.6	18.8
Female	18.4	19.3	17.0	19.8	29.2

Source: Eurostat, Labour Force Survey (last update 28.01.2013).

In Central Macedonia total unemployment reached 19.5% in 2011, up from 8.9% in 2007. In East and West Macedonia unemployment levels have consistently been significantly above the national average reaching 19.9% and 23.2 respectively in 2011, i.e., a 10.2% and 12.2% increase since 2007.

Regional data is further supported at a municipality level, with data showing all municipalities in the study area have high unemployment levels (from 8.3% up to 24.41%), with a large proportion of the unemployed population represented by young people (under 25). In Iraklia, Emmanouil Pappa and Pella (Central Macedonia), as well as Eordea (West Macedonia) this segment represents over 60% of the unemployed population. *Table 6-114* presents information on employment levels by municipality[121].

Table 6-114 Employment by Municipality

Municipality	*Economically Active*			*Non active economically (% of the population)*
	Employed (% of the Economically active)	*Unemployed (% of the economically active)*	*Young among unemployed (% of the unemployed)*	
Alexandroupoli	91.67	8.33	54.32	55.40
Maronia - Sapes	87.53	12.47	45.08	53.50
Komotini	90.11	9.89	49.71	55.87
Iasmos	91.21	8.79	33.22	48.49
Avdira	86.01	13.99	39.08	53.92
Topiros	89.05	10.95	50.98	48.63
Nestos	92.18	7.82	54.43	52.84
Kavala	87.23	12.77	41.12	56.10
Doxato	80.89	19.10	41.32	57.39
Amfipoli	84.30	15.70	57.86	61.41
Nea Zichni	88.91	11.09	56.13	56.91
Em. Pappa	89.67	10.33	66.09	56.78
Serres	85.76	14.24	49.82	54.74
Iraklia	86.71	13.29	63.18	56.83
Lagada	90.28	9.72	51.17	55.28
Oraiokastro	89.89	10.11	48.66	50.22
Chalkidona	90.05	9.95	46.54	53.99
Naousa	85.13	14.87	48.33	53.00
Edessa	87.83	12.17	53.75	55.90
Skydra	89.06	10.94	57.13	50.68
Pella	89.31	10.69	61.47	50.99
Eordea	86.95	13.05	61.86	60.10
Kastoria	76.42	23.58	38.09	52.65
Orestida	75.59	24.41	38.14	54.39
Amyntaio	86.69	13.31	59.85	59.41

Source: Hellenic Statistical Authority, Census 2001, Employment Statistics

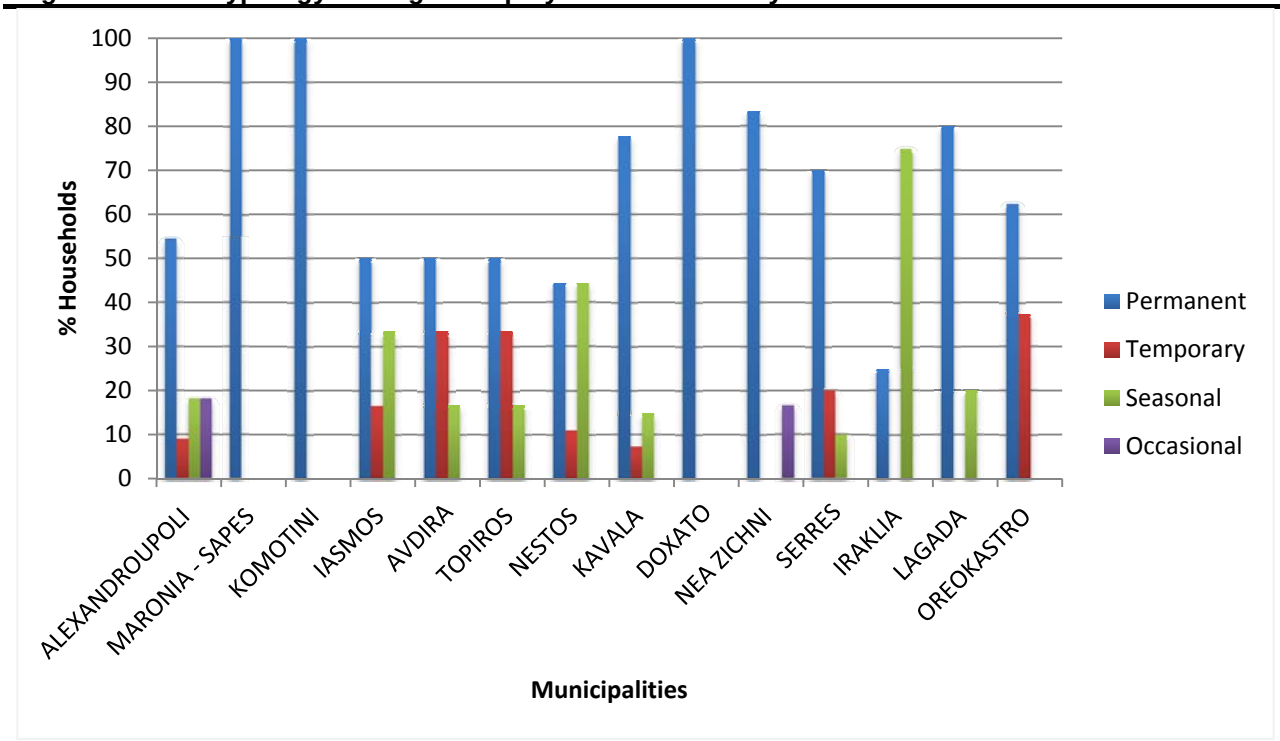
[121] However, it must be taken into consideration that the data presented in *Table 6-114* reflect the conditions of the previous decade and not the current reality, especially after the economic crisis.

In the study area, unemployment rates were higher in the municipalities of East Macedonia – Thrace; in the municipality of Kavala 19% of the surveyed population was unemployed, followed by the municipality of Topiros (18%) and Alexandroupoli (10%). In Central Macedonia, the municipality of Chalkidona reported the highest proportion of unemployed people (16%), followed by Iraklia (15%) and Lagada (10%). In West Macedonia the highest unemployment rate was reported in Amyntaio (15%), followed by Eordea and Kastoria (13% respectively).

The majority of employed respondents are permanently employed in waged labour (66%) and a smaller number work in seasonal and temporary employment (15.2% and 12.5% respectively). Certain municipalities recorded above average numbers, with 100% of respondents in Komotini, Maronia – Sapes and Orestida reported being in permanent employment, and 75% of respondents in Iraklia are seasonally or temporarily employed.

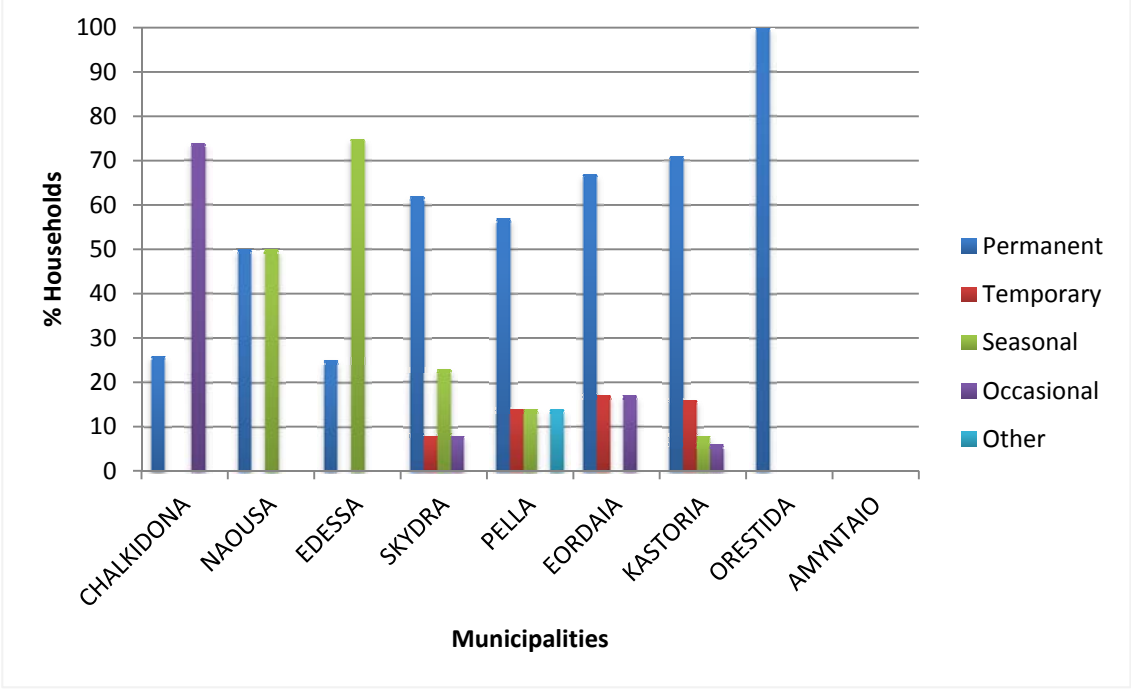
Occasional employment was reported by approximately 14.1% of the population (14.1%), with highest record in Chalkidona (74%) and Eordea (17%). A smaller percentage was recorded in the municipalities of Alexandroupoli, Nea Zichni, Skydra and Kastoria. *Figure 6-107* and *Figure 6-108* present the different types of waged employment throughout the study area.

Figure 6-107 Typology of Waged Employment in the Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-108 Typology of Waged Employment in the Study Area in TAP Greece West



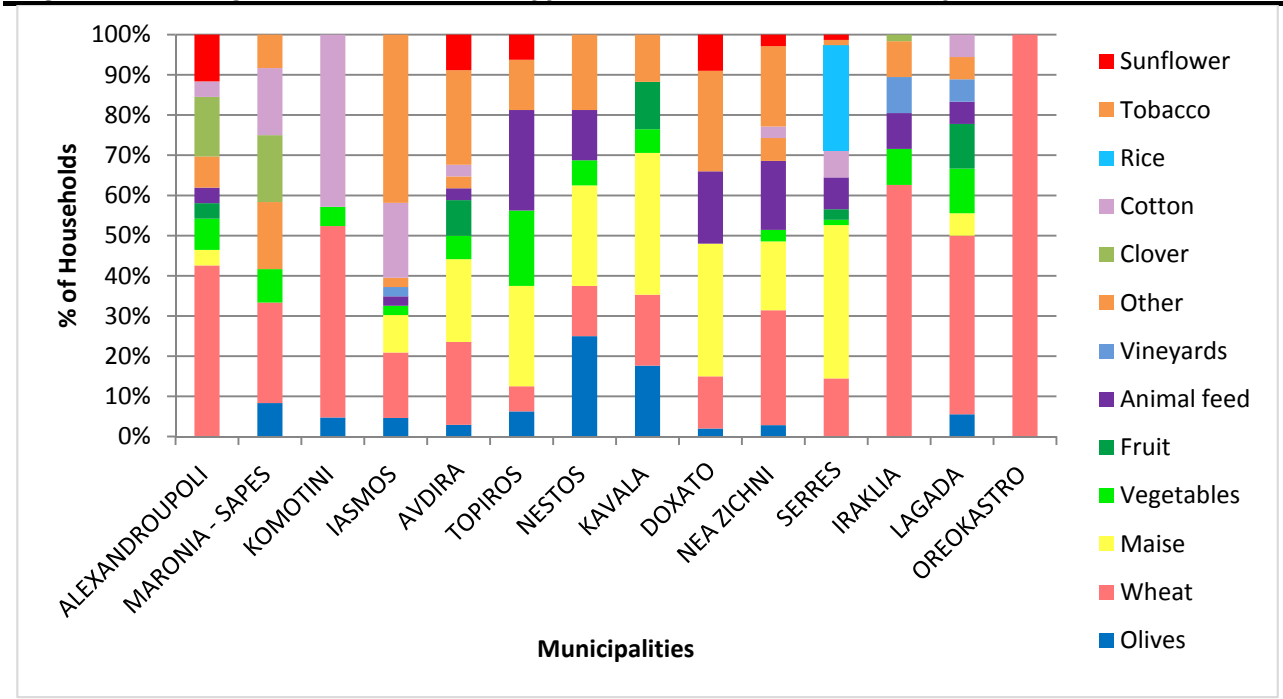
Source: Household Survey for the TAP Greece ESIA (2011)

6.4.4.5 Agricultural Production

Surveyed households within the study area in TAP Greece East reported undertaking a range of agricultural activities, including the production of mainly seasonal crops and animal husbandry, primarily raising of sheep and goats.

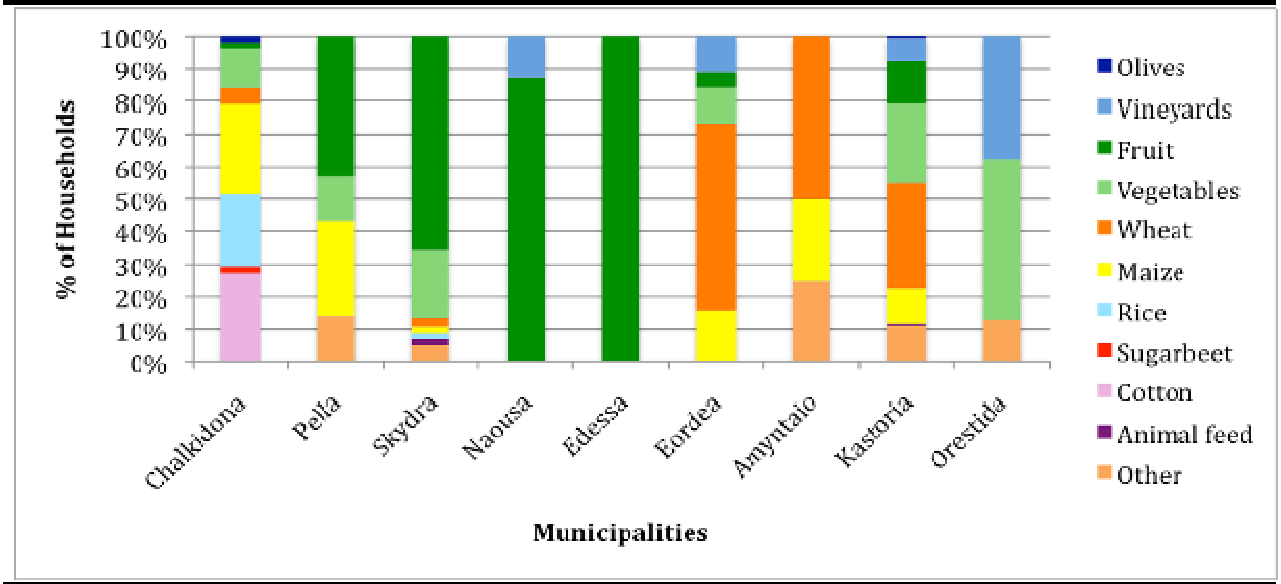
Cultivation of seasonal crops is mainly wheat and maize, which represent between 25% -100% of produce in both regions. The selection of the cultivated crops is based on various factors, including the quality of the soil, the availability of water, the climate of the area, as well as selling prices and subsidies. *Figure 6-110* and *Figure 6-110* below present the different type of agricultural produce cultivated in the socioeconomic study area of TAP Greece East and TAP Greece West.

Figure 6-109 Agricultural Production Types in the Socioeconomic Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-110 Agricultural Production Types in the Socioeconomic Study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

In the eastern section of the study area, in addition to wheat and maize, tobacco and cotton cultivation also play an important role in local agricultural activity. Tobacco cultivation was reported in varying quantities in most eastern municipalities and represents between 8%-42% of crops cultivated, with the largest proportion found in Iasmos (42%). It was reported during focus group meetings that in East Macedonia – Thrace tobacco cultivation is the main agricultural activity for the Pomak population. Cultivation of cotton is also primarily found in East Macedonia-Thrace, with high incidences recorded in the municipalities of Komotini (43%), Iasmos (19%) and Maronia – Sapes (17%). Cotton cultivation is an important source of income for these municipalities, but as reported by focus group participants, cotton worms are a major threat that often destroys production. Other crops found in the eastern section of the study area are clover (as reported by 17% of the surveyed households in Maronia – Sapes and 15% in Alexandroupoli) and sunflowers used for bio-fuel (as reported by 12% of households in Alexandroupoli and 9% in Avdira).

Permanent crops are also found throughout the eastern section of the study area, with olive tree cultivations reported in almost all settlements in varying quantities (as reported by 3% - 25% of surveyed households). According to the household survey results, olive trees are an important crop for the municipality of Nestos (25% of those cultivating) and Kavala (15%). Fruit tree cultivation is less prevalent, but still reported by a small number of households in Kavala, Avdira and Alexandroupoli. 2% of households cultivating vines was also reported in Komotini

Surveyed households in Central Macedonia grow an equally varied selection of products, which is predominantly seasonal crops including wheat, maize, cottom and rice.Rice cultivation, represents 26% of all crops grown in the municipality of Serres and 17% in the municipality of Chalkidona. Through the municipalities of Nea Zichni and Chalkidona, olive production was reported in Lagada and Nea Zichni (6% and 3% respectively). A small number of households in Serres and Lagada reported fruit tree cultivation (3% and 11% respectively). Vineyards were also found in Iraklia (9%) and Lagada (6%).

Box 6-15 presents further comments from farmers' focus groups and key informant interviews conducted in the TAP Greece East study area.

Box 6-14 Farmers' Comments on Agricultural Activity in the Socioeconomic TAP Greee East Study Area

Has farming changed? If yes, how and what do you think are the reasons for this?:

"*Yes, farming has changed. It is not our choice –it's due to the "social agriculture policy" which imposes new products for cultivation*." **(Key Informant Interview, Lachanas, municipality of Ladaga)**

"*We wanted to change our agricultural cultivation and we tried pomegranates and asparangus. We did not succeed because there were not any cooperatives to promote these products and the effort stopped."* **(Focus Group Farmers, Mitrousi, municipality of Serres)**

"*We are involved with traditional cultivation because we do not have advisors to assist us. We were proposed to cultivate (the natural herbal sweetener) but we did not know how. In any case the support of the Ministry of Agriculture is required.*" **(Focus Group Farmers, Symboli, municipality of Amfipoli)**

"*Yes, it has been changed. In the past there were vineyards. Vineyards require a lot of work. Cattle raising is easier. Everything is done mechanized. The cultivation was adapted to suit cattle raising requirements.*" **(Focus Group Farmers, Pentalofos, municipality of Oreokastro)**

"*After the closing down of nearby industries, the selection of cultivations has changed*.' **(Focus Group Farmers - Agia Paraskevi, municipality of Doxato)**

What are the key issues facing local farmers?:

"*Low selling price of the products, high price of raw materials and machinery, relations with wholesalers, no land redistribution, reduced availability of water*" **(Key Informant Interview, Chamilo, municipality of Alexandroupoli)**

"*Large production costs (fertilizers, machines etc) and low selling prices*" **(Key Informant Interview, Polysitos, municipality of Avdira)**

"There are landslides in some fields (…) Local authorities are indifferent" **(Focus Group Farmers - Krinides, municipality of Kavala)**

Source: Field Survey for the TAP Greece ESIA (2013)

Through the municipalities of Pella, Skydra, Naousa and Edessa the socioeconomic study area crosses an area of increasingly intense permanent crop production. Surveyed households in these municipalities reported that between 27% (Pella) and 79% (Naousa) of all crop production are fruit, mainly peaches and apples. For long stretches of the route in Pella and Skydra (between km markers 41 and 65), the route crosses areas of nearly 100% tree crops bordered by agricultural roads and occasional plots of annual crops such as corn or wheat.

Figure 6-111 Satellite image of Peach Tree Plantations in Skydra (pipeline in red)



Source: High Resolution Satellite Imagery. Image prepared by ERM (2011)

Additional crops grown by surveyed households in these municipalities include the production of vegetables in greenhouses in Pella and Skydra (9% and 18% respectively), maize in Pella (18%) and grapes in Naousa (11%). Greenhouses are extremely common along the route in Skydra and are utilised to farm a number of fairly high value crops, including tomatoes, eggplants, beans and cucumber (see *Figure 6-112*).

Figure 6-112 Photo of Greenhouse in Aspron (Skydra (EC) municipality)



Source: ERM Field Survey (2011)

As the socioeconomic study area reaches West Macedonia and the municipalities of Eordea, Amyntaio and Kastoria, wheat becomes the dominant crop (22%, 33% and 15% of crops grown, respectively), followed by maize (6%, 17% and 5%). Vegetables grown in greenhouses can also be found in the municipalities of Kastoria and Orestida (11% and 12% respectively) in the west of the socioeconomic study area.

Animal husbandry is an important source of income for most settlements throughout the study area. In TAP Greece East livestock ownership is reported particularly high in the municipality of Maronia – Sapes (60% of surveyed households), Alexandroupoli, Komotini and Serres (40%). However, according to focus group participants in various settlements, livestock is of vital importance for local farmers in other municipalities as well, such as Oreokastro, Chalkidona and Iasmos. The type of livestock owned by surveyed households in TAP Greece East varies, with the most common being poultry, sheep, goats and cattle. Poultry are raised in almost all municipalities, with the exception of Avdira and Oreokastro, but they are particularly prevalent in the municipality of Komotini (100% of all owned livestock is poultry), and Maronia – Sapes (95%). Sheep are the main livestock raised in the municipality of Topiros (96% of owned livestock), Iraklia (83%), Nestos and Lagada (78%). Goats make up 74% of all livestock reported by households in Iasmos municipality, whilst cattle represents 71% of all livestock reported in Oreokastro municipality. In the study area in TAP Greece East, there are also two ostrich-breeding farms, one in Pentapoli (municipality of Serres) and one in Alexandroupoli, which is shown in *Figure 6-113* below.

Figure 6-113 Ostrich Breeding Unit in Alexandroupoli



Source: ASPROFOS, Field Survey (2013)

In TAP Greece West animal husbandry is practiced by between 20% and 60% of surveyed households in the socioeconomic study area. The largest proportion of households reporting keeping livestock was found in the municipality of Amyntaio (60%) followed by Chalkidona (46%) with the lowest proportion found in Kastoria (20%) and Naousa (22%). As in TAP Greece East, poultry is prevelant in surveyed households practicing animal husbandry and reported in every municipality. A smaller proportion of surveyed households reported keeping sheep, goats and rabbits, which can be found in two thirds of municipalities. Pigs were reported by surveyed households in 4 of the 9 municipalities in TAP Greece West, with the largest number of households keeping pigs found in Orestida (33%). Surveyed households in only 2 municipalities reported keeping cattle (Skydra and Kastoria).

6.4.4.6 Industry and Commerce

Industrial and commercial activities in the socioeconomic study area are mainly small scale, with medium sized industries found in the more densely populated settlements. Industrial activity is predominantly localised around the organized industrial zones found in each region. Nevertheless, there are some large-scale industrial facilities situated close to the socioeconomic study area, representing a significant source of employment for households within these areas. In the municipalities of Komotini and Kavala, where organized industrial zones are located close to the study area, the manufacturing industry employs 9% and 7% of surveyed households, respectively. There is also a new industrial area currently being developed in the municipality of Komotini, in the area between the settlements of Mesochori and Itea.

Figure 6-114 presents a view of Kavala Oil industrial facilities, in the area of Nea Karvali.

Figure 6-114 Kavala Oil Industry, Nea Karvali Facilities (municipality of Kavala)



Source: ASPROFOS, Field Survey (2013)

Many industries and craft enterprises in the study area have closed during the last few years, however, agro-industry and other manufacturing industries (wood products, marble and mineral processing) continue to play a significant role in the economy of the study area in TAP Greece East. Agricultural cultivation is interrelated with most of these local industries; for instance, in Monoklisia (municipality of Serres), farmers stopped cultivating tomatoes and sugar beet when the nearby sugar processing and tomato canning factories were closed (see also *Box 6-14* above).

A number of households in the eastern section of the study area are occupied in mining, including marble, stone and hydrocarbon mines that operate in the wider area. In East Macedonia – Thrace, mining employs 11% of surveyed households in the municipality of Nestos and a smaller proportion in Iasmos (5%) and Kavala (4%). However, during the last 15 years local communities have been opposing planned gold mining projects in the area and demanding consultation with the people that will be immediately affected by such projects. They expressed fears that negative impacts on the environment that is the basis for their livelihoods will not be properly mitigated.

In TAP Greece West in the region of Central Macedonia, industrial activity is predominantly localised around some medium scale industries close to Thessaloniki and processing and canning factories in Pella and Skydra. In addition, a large number of surveyed households in Pella reported working in local shops and retail. Industrial activity is much more widespread in West Macedonia and ranges from mining and quarrying to large scale energy plants. In Eordea and Amyntaio the socioeconomic study area crosses an area of mining, with concessions located across large sections of these municipalities. Eordea is also the location of several large-scale coal-fired power plants, employing large numbers of people in the local area.

Trade in East Macedonia – Tharce employs a significant proportion of the population in the municipality of Nestos (36%), Iasmos (18%), Kavala and Avdira (13%). In Central Macedonia trade is represented by lower proportions of the surveyed population, as seen in the municipalities of Iraklia (18%), Oreokastro (13%) and Nea Zichni (11%), with the excepection being in Pella where 38% of households reported working in business and trade In most cases, these percentages occur in municipalities that contain large settlements, e.g. the settlements of Nea Karvali, Diomidia, Nea Zichni, Melissochori and Drymos., A number of local shops such as bakeries, creameries, kiosks, butchers etc. and small businesses that serve the needs of the

whole municipality are located in these settlements. In municipalities situated close to urban centres (e.g., the municipality of Nestos and Oreokastro) or in those where the soil is poor and agricultural production is not profitable (municipality of Iraklia), a proportion of people are employed in trading services in the nearest urban centre of the area.

Trade and services in West Macedonia accounts for a significant percentage (11 – 35%) of employment, particularly in settlements near the large population centres of Kastoria and Ptolemeida. This sector includes individuals who are employed in wholesale and retail shops, including bakeries, creameries, kiosks, butchers, flower shops, car shops etc.

6.4.4.7 Fishing and Hunting

In addition to legal entities, hunting associations in Macedonia are managed by the Hunting Federation of Macedonia and Thrace, and work in collaboration with Authority Bodies, Local unions and stakeholders, public services, NGOs and Universities. Fishing is regulated by the Ministry of Rural Development and Food, and hunting is regulated by Law 86/1969 (Forest Law) and the Respective Forests Directories, who are responsible for monitoring hunting and providing licences to hunters at a regional level.

In East Macedonia – Thrace, there are plans for further development of the fishery sector with a focus on aquaculture.[122] However, according to the Hellenic Statistical Service,[123] the most productive areas are outside of the pipeline corridor.

Fishing was reported by surveyed households throughout the scocioeconomic area, with the exception of Maronia-Sapes, Komotini and Topiros in East Macedonia-Thrace and Oreokastro, Naousa and Pella in Central Macedonia. Between 2% and 25% of households fish but all households reported that fishing is only undertaken as a recreational sport.

Hunting is also a recreational sport undertaken by surveyed households within the study area, with the exception of Naousa and Pella in Central Macedonia and Amyntaio in West Macedonia. In the municipalities of Alexandoupoli and Maronia – Sapes East Macedonia-Thrace 28% to 30%

[122] Operational Programme of Macedonia – Thrace 2007 – 2013, Avaliable at: http://www.espa.gr/elibrary/Summary_of_OP_Macedonia%20_Thrace.pdf
[123] ELSTAT Statistics Database, Fishery. Available at http://www.statistics.gr/portal/page/portal/ESYE. Accessed 05 May 2013.

of households take part in the activity, primarily in the area surrounding the Rodopi Mountains and Evros River. In Edessa (Central Macedonia) and Kastoria (West Macedonia) it was also reported to be an important activity, with between 6% and 37% of surveyed households hunting. The highest number was recorded in Edessa in Central Macedonia.

Information derived from meetings with members and representatives of Hunting and Fishing Associations in the study area are presented in the box below.

Box 6-15 Fishing and Hunting Activities in the Study Area

Meetings held with Hunting and Fishing Associations in TAP Greece East

Meetings with members and representatives of Hunting and Fishing Associations in the study area were held in Thessaloniki, Serres, Kavala and Xanthi. All of the participants noted that hunting and fishing are important recreational activities for men in the area, in addition to those that come to the area specifically for this purpose. The Pageo mountain, the area surrounding Diomidia and the mountainous areas of Sivri and Skaloti are all popular hunting locations. Hunting is seasonal and runs from the 20th August to 28th February, while fishing takes place throughout the whole year, but the “high season” is Spring-Autumn.

It was reported that a fairly wide variety of game is targeted in the area, including wild boar, hare, deer and various species of birds (ducks, woodcocks, turtledoves, partridges, ducks, ringdoves, woodpigeons, blackbirds, wild doves etc). Fishing in the bay of Porto Lagos, rivers and lakes, including Vistonida lake, is also popular. Fish targeted in the area included carp, eels, butterfly fish and "whatever the hook catches".

Participants stated that the quality and quantity of hunting and fishing has recently deteriorated, something they attribute to the chemicals that are used on crops, as well as general climatic and environmental changes.

Meetings held with Hunting Association of Kastoria and Edessa in TAP Greece West

In several of the smaller settlements in the Vermio Mountain area and the western sections of the route, hunting is a major recreational activity for men in the area; it is prevalent among both younger and older segments of the population.

Hunting associations in the municipalities of Edessa and Kastoria are well organised and funded, and sustain significant membership numbers (1,000 people in Edessa and 900 in Kastoria). Hunting associations of Macedonia are managed from the Hunting Federation of Macedonia and Thrace, and work in collaboration with Authority Bodies, Local unions and stakeholders, public services, NGOs and Universities. Work undertaken by associations includes:

- Game species management techniques, releases and monitoring;
- Rearing of Game species
- Wildlife monitoring
- Forest protection
- Information for hunters
- Public awareness raising on the importance of biodiversity
- Environmental education projects
- Planning of training projects

Hunting is seasonal and runs from the 20th August to 28th February; the high season for most game runs from late September/October through the end of January. In Edessa people hunt recreationally from a number of study area

settlements including Agia Fotini, Ano Grammatiko and Kato Grammatiko and in Kastoria people h Lithia, Korissos, Militsa, Poria, Chiliodentro and Mesopotamia hunt in the area. A fairly wide variety of game is targeted in the area, including:

- birds: woodcocks; partridges; quails; wood pigeons; turtledoves; ducks and guinea fowl (seasonal);
- hares;
- wild boars;
- foxes.

The associations reported that the government is largely indifferent to hunting and does not assist the associations. People are becoming increasingly concerned about the animals and looking for ways to protect them

Source: Field Survey for the TAP Greece ESIA (2011 and 2013)

6.4.4.8 Use of Natural Resources

The use of natural resources is limited to certain locations in the socioeconomic study area. In TAP Greece East it is only found in 1% - 2% of surveyed households where it was reported that almost 100% of all natural resources collected in the socioeconomic study areaare used for consumption within the household with only two households reporting using less than 50% of collected produce.

Bee keeping is the most common use of natural resources in the socioeconomic study area in TAP Greece East and is found in the municipalities of Alexandroupoli (8%) in East Macedonia-Thrace and Nea Zichni (3%), Serres (4%), Iraklia (6%) and Lagada (3%) in Central Macedonia. During community discussions, study area residents explained that they move hives to different locations depending on the season and there is no one location used for the collection of honey. In TAP Greece West bee keeping was reported in 3% and 2% of surveyed households in Chalkidona and Skydra, but nowhere else in the socioeconomic study area. Of the few households keeping bees, almost all used the honey for household use rather than sale, although there are a few exceptions. For example one household surveyed in Skydra sold more than 50% of their honey.

The number of surveyed households collecting medicinal plants is highest in Maronia-Sapes (20%) in East Macedonia-Thrace and Naousa and Orestida (13%) in Central and West Macedonia respectively. Collection of medical plants were also found in Eordea (9% of surveyed households), Iraklia (6%) and Kastoria. In TAP Greece East all households collecting medicinal plants use more than 50% of the produce for their own consumption. In TAP Greece West the households collecting medicinal plants reported selling their produce.

Collection of firewood is carried out in four municipalities in TAP Greece East, Alexandroupoli (8% of surveyed households), Maronia – Sapes (10%), Iraklia (6%) and Lagada (3%), as these municipalities are close to forested areas and the use of firewood for heating and cooking is part of their traditional lifestyle, as well as a way to reduce household spending. The survey results show that ownership of forested land by households is highest in the municipalities of Alexangroupoli (3%) and Lagada (3%). This would indicate that the majority of wood is collected on land that is not owned by the household, although it is unclear whether this is State or privately owned land.

In TAP Greece West, the collection of firewood is the most common use of natural resources in the socioeconomic study area, found in 6 of the 9 municipalities and reported in between 5% (Skydra) and 21% (Edessa) of surveyed households. Firewood is predominantly collected for personal consumption, except in Kastoria where more than 50% of all wood collected is sold. According to interviews with municipal authorities and local settlements in Edessa and Kastoria, illegal logging in the area is rare. In some areas along the route, for example near Kato Grammatiko, the government has granted tracts of forest to low-income families and pensioners to meet their firewood needs (but not for commercial use)[124]. Logging is undertaken on a small-scale commercial basis in the municipality of Edessa. All three settlements in the corridor in Edessa (Agia Fotini, Ano Grammatiko and Kato Grammatiko) report logging as an important economic activity. In the settlement of Agia Fotini logging is managed by a Forest Association, which is essentially a small company that works with the forest authorities. Community members with permission to log cannot legally sell the wood themselves, but must go through the forest association.

Additional information on logging in the socioeconomic study area is presented in *Box 6-16*.

Box 6-16 Logging in Greece

Forest exploitation in Greece is undertaken legally in two ways: either with labour employed by the forest authorities or by forest associations giving the right to log according Article 74 of Law. 1541/85. Labour employed by the forest association is paid per unit of product, which is then made available to the market by the forest authority through tender procedures. If the forest association gives permission, the wood must also be sold via the forest associations. As payment the forest association takes 12% of the income earned, the municipality takes 5% and the Central Fund for Agriculture Livestock and Forestry also takes 5%. All logging is regulated and managed by the Forest Authorities under the framework of Forest Legistlation.

Source: ERM Field Survey for the TAP Greece ESIA West (2011)

[124] KII, Director of the Forest Services of Edessa, September 2011

6.4.4.9 Tourism

Tourism in Greece is administratively divided between central, regional and local tourism authorities. The Ministry of Tourism (Gov. Gazette 141/A/2012) is the competent authority to deal with the overall Greek tourism policy as well as with the regulation, planning and programming of tourism development within the country. The Greek National Tourism Organisation (GNTO), a Public Entity supervised by the Ministry of Tourism, is the ruling state agency for the tourism promotion and the licensing of tourist enterprises, and a Regional Department of GNTO exists in West and Central Macedonia and Eastern Macedonia–Thrace. Other relevant institutions include the National Tourism Board, aiming to establish, follow-up and update the National Development Strategy and the Greek Organisation of Tourism Education and Training (O.T.E.K), which provides education and training for professions in the field of tourism[125].

All regions have archaeological sites and areas of natural beauty, which make popular tourist destinations. Central Macedonia is the most visited region of Greece accounting for 18.2% of the total tourist flow in the country[126], with Thessaloniki playing a leading role. Apart from the area of Thessaloniki, the regional unit of Serres is an important destination for many forms of tourism (environmental, speleological, archaeological, therapeutic, religious, winter, agri-tourism etc). Close to the study area, the archaeological park and Museum of Amfipoli are known for their archaeological importance. In the municipality of Nea Zichni there are the renowned caves of Alistrati, which are among the largest caves in Europe. Also, along the river Aggitis (municipality of Nea Zichni) there is a gorge where visitors can participate in organized outdoor activities such as rafting, canoeing and kayaking.

As reported during the field visit in Symvoli, near the gorge of Aggitis, locals use tourist infrastructure for weddings and exhibitions and there are plans for further investment in tourism in the local area. However, it was also reported that in the last few years, tourism in the area has fallen, as both Greeks and foreigners “have limited their expenses”[127].

Settlements on Vermio Mountain such as Agia Foteini, Ano Grammatiko and Kato Grammatiko in Central Macedonia were also identified as potentially important tourist areas during the socioeconomic field trip in 2011. It was recorded that the area might have an eco-tourism

[125] Annual Tourism Reporting, European Comission 2011.
[126] Eurostat (2010). Tourism. Available online at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-HA-10-001-11/EN/KS-HA-10-001-11-EN.PDF
[127] Key Informant Interview, Symboli (municipality of Amfipoli), ASPROFOS, 2013.

development implemented as part of the *Integrated Programme of Sustainable Development of Vermio Mountain*. The Integrated Programme for Sustainable Development of Vermio Mountain was approved in 2010, and has a total budget of €198.6 million. Plans include the following:

- Improving infrastructure and connectivity;
- development of alternative eco-tourism;
- enhancement of local agriculture and local products; and
- protection of natural and cultural environment and improvement of quality of life.

The programme includes parts of Pella, Eordaia and Naousa municipalities but no specific actions have been defined and no movement towards implementation has been noted since the plan was released.

In East Macedonia – Thrace beach resorts have been developed along the coasts of Kavala, Xanthi, Rodopi and Evros, whilst maritime tourism including sailing activities is mainly developed in the coastal areas of Kavala. As in much of Greece, tourists visit the wider area to see historic monuments such as those found in Xanthi, Komotini and Kavala, or archaeological sites, such Philippoi, 17 km from Kavala.

Local authorities wish to further develop alternative forms of tourism such as cultural, folk, religious and eco-tourism. The Special Regional Plan for Sustainable Development of Tourism aim to develop the area from western Alexandroupoli to Maronia – Sapes in East Macedonia – Thrace, in addition to the Delta of Evros and Nestos Rivers for eco-tourism and small settlements of northern Thrace inhabited by Pomaks so visitors can experience alternative traditions and cultures.

In West Macedonia the area of Kastoria Lake attracts many tourists, both domestic and foreign. Kastoria has many sightseeing activities such as museums, a Limnaion prehistoric settlement, Dragon's cave, churches and the petrified forest of Nostimo settlement in the south part of the municipality. Apart from regular tourism, Kastoria also attracts a large number of visitors each year for several conferences that are held in the town. There are some smaller settlements in the study area that hold celebrations or memorials for important events, which attract domestic tourism. Purgoi settlement in Eordaia Municipality holds a memorial every year for the destruction

of the settlement through German bombing in 1944. This memorial is an official event and attracts many politicians to the settlement.

Other important destinations in the broader study area include Numfaio settlement in Florina regional entity, Prespes lake in Florina regional entity and Kaikmatsalan ski resort on the north of Vermio mountain.

6.4.4.10 Working Practices and Labour Rights

Labour standards in Greece are directly referenced in the Greek Constitution and requirements are outlined in a large number of acts, laws and presidential decrees. Greece is also a member of ILO and has ratified 32 ILO Conventions, with an additional 49 to be ratified in the future.

National legal requirements set out in Greek legislation and ratified in ILO Conventions include:

- General labour and employment acts;
- freedom of association, collective bargaining and industrial relations;
- elimination of child labour, protection of children and young persons;
- equal opportunities and treatment;
- labour inspection;
- employment security, termination of employment, labour contracts, social security; and
- occupational safety and health.

The Labour Inspectorate Body (S.EP.E) established in 1999, monitors labour and working conditions in Greece. Its role is to enforce labour legislation in the private and public sectors, to protect the legal rights of the employees and to secure the health, safety and welfare of workers in Greece. S.EP.E reports directly to the Minister of Employment and Social Protection. It comprises a Central Labour Inspectorate, 96 regional Social Labour Inspectorate Offices and 52 regional Technical and Medical Labour Inspectorate Offices.

Despite the rigid legislative framework, the on-going financial crisis has affected working practices, with workers showing more inclination to abandon labour rights in order to secure

employment[128]. In his address to the members of the European Parliament in September 2011, the Director-General of ILO stated that in Greece unions have reported alleged violations of ILO conventions. On the basis of these allegations, an ILO High Level Mission to Greece took place in September 2011, with the mandate to investigate complaints in the areas of freedom of association, collective bargaining, wages, social security, employment policy, labour inspection and non-discrimination.

The Mission observed that social cohesion in Greece is being severely challenged as a result of the economic situation and that Greece has not yet implemented the changes suggested by the Euro Zone for management of the economy, which includes the labour market. The Mission is also concerned that the current social and labour conditions could have a detrimental impact on collective bargaining, as well as on the capacity of the trade union movement to respond to the concerns of its members. It was reported that a priority issue is to address problems with the labour relations system, with assistance from the ILO, who can play an important role in supporting the Government and the social partners to develop and implement relevant and appropriate labour market and institutional reforms[129].

The Manpower Employment Organisation (OAED) is the main instrument for the implementation of the government policy on employment, with a view to ensure that necessary preconditions of matching labour supply and demand in harmony with the economic development of the country. In order to fulfil its mission, OAED runs a number of programmes addressing unemployed, new entrants to the labour market, vulnerable groups (e.g. Roma in Eastern Macedonia) and specific economic sectors.

Labour unions in Greece are common in all industries and unionisation is a key element of Greek labour legislation, which is strongly upheld. In the construction industry there are several unions in East Macedonia – Thrace, Central and West Macedonia , and their rights are established through collective labour agreements. Collective labour agreements are agreed in writing between the unions and employers or between trade union workers and employers. They define the conditions of employment between the parties and introduce mandatory minimum wages and

[128] Clauwaert, S. & Schömann, I. (2012). *The Crisis and National Labour Law Reforms. A Mapping Exercise.* Working Paper 2012.04, European Trade Union Institute, Brussels. Avaliable at: http://www.etui.org/Topics/Social-dialogue-collective-bargaining/Social-legislation

[129] International Labour Office. Report on the High Level Mission to Greece. Available online at: http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---normes/documents/missionreport/wcms_170433.pdf

salaries, regulate cooperation between employers and employees or workers and define rights and obligations of the contracting parties.

In all urban centres of all three regions, there are four different structures that support finding employment:

- Manpower Employment Organization and its Employment Promotion Centres;
- Offices of information to the Unemployed and Businesses, which are funded by Manpower Employment Organization;
- Liaison offices of Universities and Technical Universities, funded by Operational Programme in Education and Initial vocational training by Ministry of Education;
- Helpdesks for unemployed, established by regional or local authorities.

Alternatively, established contractors and technical companies operating in an area have a cooperative network where they can find workers when required.

According to research by the Labour Centre of Thessaloniki, Macedonian Institute of Labour, the effectiveness of existing government-based employment resources is often limited due to a lack of connectivity to the marketplace. As a result, these resources are not always helpful for jobseekers, including vulnerable groups.

6.4.5 Land Tenure and Use

6.4.5.1 Land and Home Ownership

Greece is still in the process of developing a cadastre system of property ownership. Once this is fully developed, the Hellenic Cadastre will be a unified and continuously updated system of information that records the legal and technical status of real estate and properties rights.
Specifically, the Hellenic Cadastre will:

- record all deeds that establish, transfer, change or abolish rights on properties on a real property-centred basis;

- guarantee all legal details it records, since every deed is registered only after its lawfulness has been checked;
- record the geographical description (shape, location and size) of the property;
- systematically record State real estate for the first time in contemporary Greece; and
- record the any rights evoking, which will help eliminate issues of informal ownership transactions.

To date, 340 of the municipalities (as they were set up prior to Kallikratis reform) have been covered by cadastral surveys and another 107 are expected to be completed by the end of 2015. After the completion of these surveys, about two thirds of the population will be covered[130]. To date, the programme has focussed on surveying urban areas, in particular major cities as opposed to rural areas. In the regions of interest for the Project the coverage has been as follows:

- East Macedonia - Thrace – 28 out of 55 municipalities;
- Central Macedonia – 38 out of 135 municipalities; and
- West Macedonia – 26 out of 61 municipalities.

The majority of landowners surveyed in the study area reported being in possession of their registration documents. Between 1% and 5% of households surveyed in Chalkidona, Skydra, Edessa and Orestida reporting not having registered documents. Additionaly in the settlement of Fylakas (municipality of Komotini), it was reported during community meetings that some people do not have title deeds, as this would require a lot of money (for heritage acceptance from their grandfather). If they perform usucaption, they will have to pay 11% of the land's nominal value in 20 years - and this is something they can not afford.

Home ownership is high in the socioeconomic study area, with between 60%-100% of surveyed households reporting owning their residence with no mortgage. The lowest levels of home ownership were found in Topiros (60%) and Pella municipalities while the highest in Nestos, Iraklia, Naousa, Edessa and Orestida (100%). In Alexandroupoli and Maronia – Sapes 88% and 100% of respondents reported being a non-rent paying occupant of the homes of relatives. The majority of household survey respondents who were not outright homeowners were either paying off their home loan or in the process of acquiring legal ownership. Property rental was found in 10

[130] Ktimatologio S.A., www.ktimatologio.gr

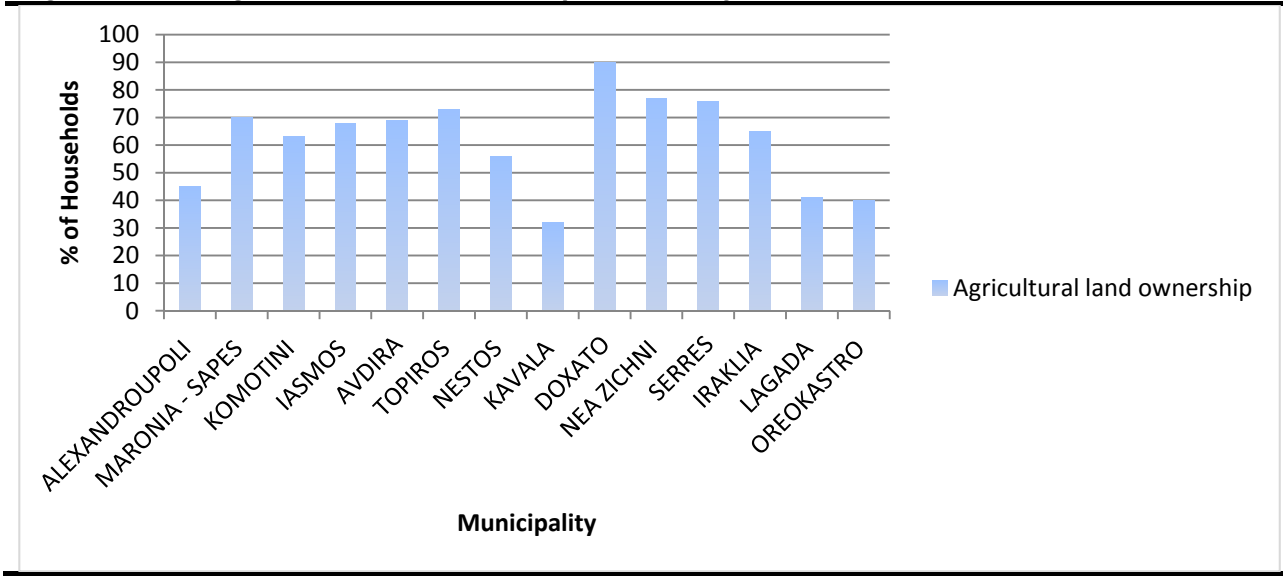
out of the 23 municipalities, but accounts for only a small number of surveyed households in each (3% - 9%).

6.4.5.2 Agricultural Land Tenure

Land distribution in the study area was carried out mainly between 1928 and 1934 by the Greek authorities and the Refugee Settlement Commission (EAP) with the aim of redistributing land to the landless. The Greek State also provided land for schools, churches and to communities to cultivate or manage. The method used to distribute land and inheritance customs has led to the fragmentation of agricultural land in Greece with average land ownership now totaling approximately 4 hectares, typically fragmented into 5 or 6 lots. Under Law 674/1977 the Greek State is promoting land consolidation in agricultural areas in order to increase efficiency and productivity in agricultural land.

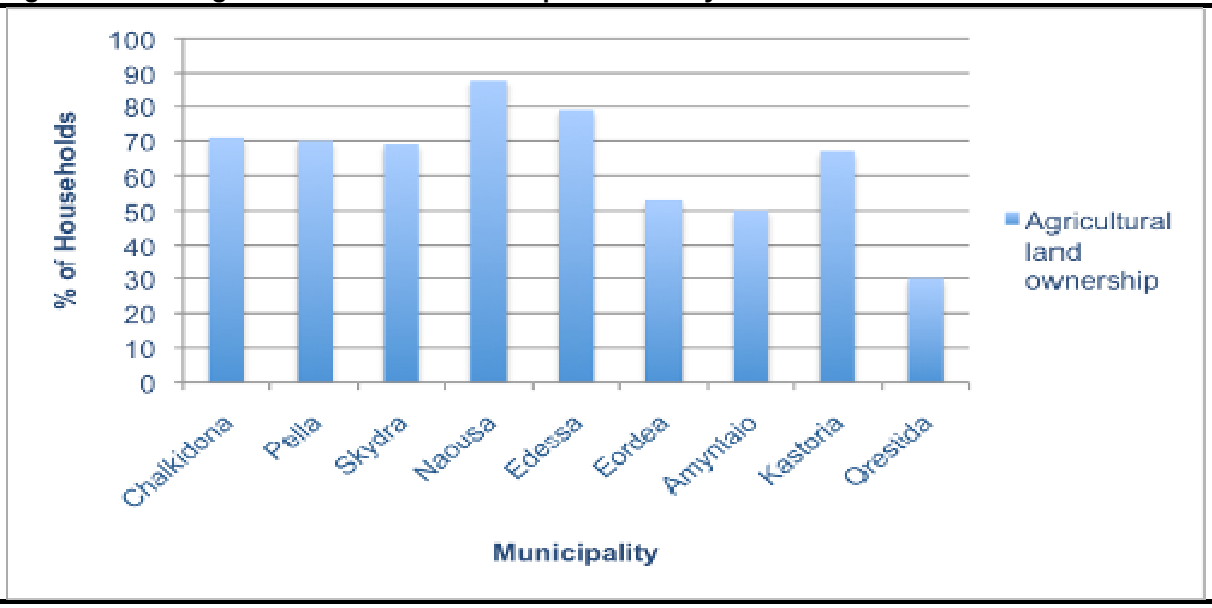
Ownership of agricultural land is high in the socioeconomic study area with over 58% of all surveyed households owning agricultural land in TAP Greece East and 64% in TAP Greece West. In East Macedonia-Thrace agricultural land ownership ranged between 73% of sampled households (Topiros) to 32% (Kavala while in Central Macedonia between 40% (Oraiokastro) to to 88% (Naousa). The number of surveyed households owning agricultural land in West Macedonia was lower, with the lowest number reported in Orestida (30%) and the highest in Kastoria (67%). The study area in Orestida is more developed and relatively close to Kastoria city, with fewer people relying on agricultural plots for income. *Figure 6-115* and *Figure 6-116* present the findings from the household survey in TAP Greece East and TAP Greece West in relation to ownership of agricultural land by municipality.

Figure 6-115 Agricultural Land Ownership in the Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-116 Agricultural Land Ownership in the Study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

The distance travelled by landowners in order to reach their agricultural land varies throughout the socioeconomic study area. Over 50% of landowners surveyed in Alexandroupoli and Maronia-Sapes in East Macedonia-Thrace, Iraklia, Oreokastro and Chalkidona in Central Macedonia and Pella, Amyntaio and Orestida in West Macedonia travel more than 2 km to reach their land. This is also true of 44% of landowners in Iasmos, 42% in Serres, 37% in Kastoria and Eordea, 32% in Skydra and 31% of owners in Komotini and Nea Zichni. This suggests that there is a relatively high possibility of the pipeline crossing land owned by a household outside the

pipeline corridor in these areas of the route. Landowners in Lagada, Chalkidona and Kastoria travel more than 1 km to reach their land. Landowners in Naousa reported travelling the shortest distance to reach their agricultural land with 25% travelling less than 0.5 km and a further 25% travelling between 0.5 km and 1 km. Landowners accessing their land at a distance of between 0 - 0.5km were also recorded in Avdira (16%), Maronia-Sapes and Nestos (14%).

Ownership of fallow land in surveyed households in TAP Greece East is low, with only 14 households (or 3%) stating that they own land that they do not cultivate, primarily in Alexandroupoli and Oreokastro (reported in 10% of households). As with agricultural land in general, the majority of fallow landowners (68%) must travel a distance of more than 2 km to access their land.

In TAP Greece West ownership of fallow land is common in the study area, particularly in West Macedonia, where the economies along the pipeline route are more mixed. Approximately 80% of surveyed households in Orestida own fallow land, 50% of households in Amyntaio and 21% in Kastoria. The proportion of households owning fallow land in Central Macedonia is lower with the highest number recorded in Pella (20%). Fallow land in the study area is typically not used for either agricultural or development purposes, though the installation of solar panels is becoming increasingly common (see *Section 6.4.6.8*)

6.4.5.3 Forested Land Tenure

Forests in Greece can be divided into the following tenure categories:

- Public ownership: Forest owned by the State; or administrative units of the public administration; or by institutions or corporations owned by the public administration.
- Private ownership: Forest owned by individuals, families, communities, private cooperatives, corporations and other business entities, private religious and educational institutions, pension or investment funds, NGOs, nature conservation associations and other private institutions.

Table 6-115 below presents the distribution of forested areas according to data from Food and Agricultural Organization of the United Nations (FAO).

Table 6-115 Distribution of Forested Areas

Ownership / forest area (1000 ha)	*1990*	*2000*	*2005*
Public	2557	2790	2907
Private	742	811	845

Source: FAO, Global Forest Resources Assessment Report (2010)

The majority of forests are publicly owned and each region or regional entity is responsible for forest management. There are some communal forests that belong to the local community, but the Regional Forestry Authority still has overall responsibility and authority for any activity carried out in the forest. Ownership of forested land is very low amongst surveyed households and was found in only 4 municipalities, namely Alexandroupoli (3%), Lagada (3%), Chalkidona and Kastoria (between 1% and 3% of surveyed households).

6.4.5.4 Land Use

In TAP Greece East, land in the study area is almost 80% agricultural with approximately 20% of this area covered by permanently irrigated lands. Industrial activity is low along the pipeline route. There are two organized industrial areas, one in Alexandroupoli and the other at Sapes, both outside the study area and two lying close: i.e. those of Komotini and of Kavala. An overview of land use in the study area is presented in *Table 6-116* below. Areas of high landscape value including wildlife refugees and protected areas are listed in Section 6.2.8.2 (Physical Environment).

Table 6-116 Overview of Land Use in the Socioeconomic Study Area in TAP Greece East

Municipality	*Land Use*
East Macedonia – Thrace	
Alexandroupoli	• Large area of non-irrigated, arable land (mainly annual cultivations - wheat and clover) • Forested area used for timber • Bee keeping in the study area
Maronia - Sapes	• Land covered almost entirely by cultivated fields with annual / seasonal crops (wheat, clover, cotton, tobacco) • Some amount of forested land used for timber • Bee keeping in the study area
Komotini	• Land in the study area covered almost entirely by cultivated fields (mainly annual /seasonal crops -wheat, maize and cotton) • Large amount of land used for animal husbandry • Organized industrial zone close to the study area and currently developing industrial activity in the study area
Iasmos	• Large amount of land used for annual cultivations and some permanent crops (olive trees and vineyards) • Large amount of land used for animal husbandry

Municipality	*Land Use*
Avdira	• Large area of annual cultivations but also permanent crops (mainly olive trees and few vineyards) • Some industrial activity in the area • Bee keeping in the study area • Dense irrigation network • Some industrial activity in the study area
Topiros	• Large proportion of land used for annual/seasonal crops (maize, animal feed and tobacco) and animal husbandry • Bee keeping in the area • Some industrial activity in the study area
Nestos	• Extensive cultivated areas, mainly with annual crops (maize and animal feed) but also permanent crops (mainly olive trees and few fruit trees and vineyards) • Some industrial activity in the wider area • Some amount of forested land used for timber
Kavala	• A highly productive plain with tracks of intensive cultivation (wheat and maize), including permanent crops (olive trees and fruit trees) • Large area of forested land • Organized industrial zone close to the study area an some industrial activity in the study area
Doxato	• Cultivated land with annual crops (wheat, maze, tobacco, sunflower) • Vegetable cultivation (for income purpose) • Animal husbandry (sheep, cow, poultry) • Borehole irrigation system and old irrigation channels that are out of use
Central Macedonia	
Amfipoli	• Cultivated land with mainly annual crops (cotton and cereals / wheat), as well as some permanent crops (fruit trees and olive trees) throughout much of the study area • Some amount of forested land
Nea Zichni	Large amount of land used for agricultural activities, mainly annual crops (wheat, maize, tobacco), as well as few permanent crops (mainly olive trees) • Dense irrigation system • Some industrial activity in the study area
Em. Pappa	• Large amount of land used for agricultural activities, mainly annual crops (cotton and cereals, wheat, maize), as well as permanent crops (fruit trees, olive trees, vineyards) • Vegetable cultivation in greenhouses • Dense irrigation system
Serres	• Extensive areas of permanently irrigated and heavily cultivated agricultural land (the Serres plain) mainly cereals and rice. • Few permanent crops scattered in the area, mainly fruit trees. • Bee keeping in the study area • Dense irrigation system of ditches and canals • Large amount of forested land • Some industrial activity in the study area
Iraklia	• Cultivated land with wheat throughout much of the study area and some permanent crops (mainly vineyards) • Bee keeping in the study area • Some amount of foresteded land used for timber
Lagada	Large amount of land used for agricultural activities, mainly annual crops (wheat and vegetable), as well as some permanent crops (olive trees, fruit trees and vineyards) • Some amount of forested land used for timber • Some industrial activity in the study area
Oreokastro	• Large amount of land used for annual crop cultivation (mainly wheat) and animal husbandry

Municipality	*Land Use*
Chalkidona	• Lands predominantly used for vineyards, annual crop production and animal husbandry • Area of planned residential / urban expansion around the settlement of N. Messimvria • Some industrial activity in the study area

Source: Field Survey for the TAP Greece ESIA (2013)

Land use in the socioeconomic study area is heavily agricultural, but also changes along with the terrain and presence of population centres along the route (see *Annex 4.6*). Land in the corridor within the municipalities of Chalkidona and Pella is permanently irrigated and predominantly used for seasonal crops, with urban and light industrial areas around settlements. From Pella through the municipalities of Skydra and Naousa, land use is dominated by intensive permanent crop production. The municipality of Edessa has a mix of land uses as this section of the corridor begins in an area used for quarrying, but continues through a large area of forests and mixed agriculture as it crosses Vermio Mountain. From here, in the municipalities of Amyntaio and Eordea, the corridor enters an area where agricultural activity (annual crops) is mixed with areas of industrial activity and land designated for mining and energy production. Seasonal crop production is the main land use throughout the corridor in the municipalities of Kastoria and Orestida, with some pockets of urban/industrial land and areas designated for quarrying. *Table 6-117* presents an overview of different land uses found in each district.

Table 6-117 Overview of Land Use in the Socioeconomic Study Area in TAP Greece West

Municipality	*Land Use*
Central Macedonia	
Chalkidona	• Predominantly seasonal crop production with some vineyards • Extensive areas of permanently irrigated land • Areas of planned residential / urban expansion around the settlements of Gefira, Aghialos, N.Messimvria
Pella	• Mixed annual and permanent crops in the east giving way to nearly continuous permanent crops (peach plantations) throughout much of the study area • Borehole/pump irrigation systems throughout
Skydra	• Mixed annual and permanent crops and sections of nearly continuous permanent crops (peach plantations) throughout much of the study area • Vegetable cultivation in greenhouses • Borehole/pump irrigation systems throughout • On-going industrial and residential development of the road between Rizon and Plevroma
Naousa	• Permanent crops (peach plantations) in the low plain and forest on Vermio mtn • Some borehole/pump irrigation systems
Edessa	• In the east, permanent crops mixed with natural vegetation • Through the mountains, the area is mostly forested land, some of which is used for firewood collection and logging • Forested areas are also used for recreational hunting by the local communities

Municipality	*Land Use*
West Macedonia	
Eordea	• Flat agricultural area, mainly annual crops, corn and cereals except apple trees in the east • Prevailing feature of the area is lignite power plants of Ptolemaida Basin
Amyntaio	• Only a small section of Amyntaio is crossed by the route. Land use in this area is predominantly agricultural, with annual crops cereals and corn on the east (Antigonos settlement) and mainly bean cultivations on the west (Varikon settlement)
Orestida	• Relatively flat area with agriculture; mainly annual crops and scattered plots of permanent crops, mainly apple trees
Kastoria	• Area of mixed industrial / touristic use with limited agriculture to the east and approaching lake Kastoria • Area of primarily annual crops (cereals), mixed with sporadic pastureland and forest as the route passes to the west

Source: Social Survey for the TAP Greece ESIA (2011)

6.4.6 Infrastructure and Public Services

6.4.6.1 Road and Transport Infrastructure

In general the roads throughout Greece are in good condition and well maintained. There are several major motorways crossing the socioeconomic study area that connect the regions of East Macedonia – Thrace, Central Macedonia and West Macedonia to the rest of Greece as well as to other major European roads.

The road network of Macedonia–Thrace consists of two main motorways: the Egnatia highway and PATHE (Patra- Athens- Thessaloniki- Evzoni). These motorways lead to the Greek national "gates" of Evzoni, which borders the FYR of Macedonia, and Prometheans, which borders Bulgaria, in addition to connecting the Macedonian Regions. In the study area, development of Egnatia highway connections between Serres and Promachonas, at the borders with Bulgaria, and between Drama and Kavala, are currently under design.

The Egnatia highway is also important at a European level as it connects the great industrial centres of the West with the East and is part of the following Pan-European Roads:

- IV, which connects Vienna to Thessaloniki,
- IX, which connects Helsinki to Alexandroupoli; and
- X, which connects Berlin to Thessaloniki.

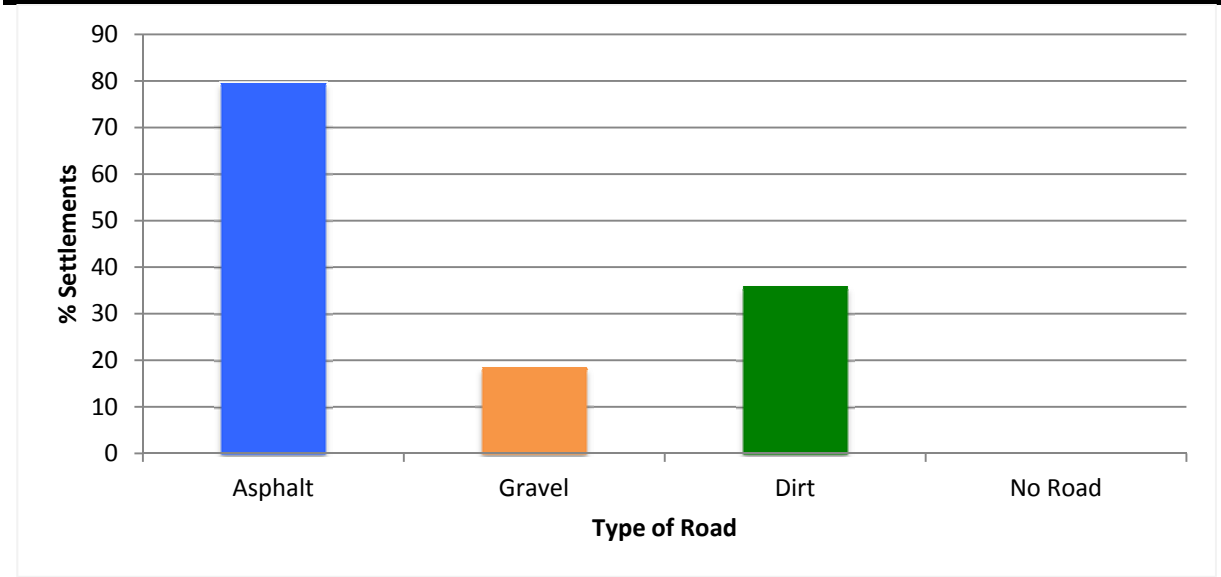
The Statista-Leropigi-Kristalopigi road is also within the socioeconomic study area and connects Albania to the Pan European Corridor VIII.

Improvements to road and transport infrastructure were seen as a priority issue in the Operational Programme "Central Macedonia – Western Macedonia – Eastern Macedonia & Thrace" 2007 – 2013. The objectives set out in this document are to improve the accessibility of Central Macedonia, both nationally and throughout Europe, and to improve access to the industrial zones, ports, isolated areas and the mountainous areas of East Macedonia – Thrace.

The road network within the socioeconomic study area is well developed and almost all of the settlements have asphalt roads, with the exception of Neos Zygos in the municipality of Kavala, Agia Fotini (around the mountainous area), Ano Grammatiko and Kato Grammatiko in the municipality of Edessa. Roads to these settlements are passable but narrow. However, in the event of bad weather, accessibility to the remote mountainous areas of Komotini, Maronia Sapes, Iasmos –, Naousa and Amyntaio can be significantly reduced. Improvement of regional roads in various municipalities along the route (Xanthi, Iasmos, Topiros, Avdira) is currently underway. The need for improvement of the local road network was also reported during community meetings in the municipalities of Avdira and Emmanouil Pappa.

A broad view of road infrastructure in the study area is presented in *Figure 6-117*.

Figure 6-117 Road Infrastructure in the Socioeconomic Study Area



Source: Household Survey for the TAP Greece ESIA (2011 and 2013)

6.4.6.2 Railway Network

The Hellenic Railways Organisation or OSE is the national railway company, which owns, maintains and operates railway infrastructures in Greece. The current network comprises 2,552 km, from which 70% are standard gauge lines (1,435 mm width).

The backbone of the network is the line from Athens to Thessaloniki. The line from Thessaloniki to Kipoi connects Central Macedonia to East Macedonia-Thrace, crossing through all regional units of East Macedonia, with the exception of Kavala.

The ”Thessaloniki–Svilengrad” railway is approximately 620 km long connecting Thessaloniki with Svilengrad in Bulgaria, passing through or near most major cities of East Macedonia - Thrace (Serres, Drama, Xanthi, Komotini, Alexandroupoli). At the Strymonas station there is a connection towards Sofia, and at Pythio (in the regional unit of Evros) there is a connection towards Istanbul.

West Macedonia is connected to Thessaloniki through a dedicated line, which runs from Thessaloniki to Edessa, Amyntaio, Kozani, and Florina. Train service in the region has been significantly reduced since February 2011 as a result of government budget cuts. Focus group participants in settlements in Edessa noted that travel to Thessaloniki has become much more difficult due to reductions in train services, with economic consequences for the area.

In the study area there are 3 railway stations, in the settlements of Gazoros, Lefkothea (Nea Zichni municipality) and Neochori (Emmanouil Pappa municipality), whilst the pipeline moves in parallel with a railway track in the settlement of Kosmio (municipality of Komotini). Focus group participants in the settlement of Neos Xerias (municipality of Nestos) reported that a new train station is planned near the settlement and expressed their concerns about probable loss of lands due to this project.

6.4.6.3 Harbours

The port of Thessaloniki in Central Macedonia is one of the largest seaports in Greece and transports international cargo representing 6% of GDP and 40% of GRP for Central

Macedonia[131]. On an annual basis, the port receives or dispatches approximately 15,000,000 tonnes of cargo and services approximately 3,500 vessels, carrying more than 200,000 passengers and 250,000 container units.

The most important ports of East Macedonia – Thrace are the existing passenger ports and the new commercial ports of Alexandroupoli and Kavala, the intermediate port of Porto Lagos (municipality of Avdira) and the port of Keramoti (municipality of Nestos), connecting the mainland with the island of Thassos. The ports of Alexandroupoli and Kavala are among the 13 most important ports in the country, in terms of goods and passengers traffic. The new port of Alexandroupoli is artificial and spreads along the south-east of the city into two functional areas, the newly established passenger port and the existing commercial port. The new port of Kavala is purely commercial[132], but growing in significance and can be found close to the settlement of Nea Karvali. The port of Porto Lagos and the port of Keramoti are fishing ports in addition to transporting cargo from regional enterprises.

In addition to the major ports, there is also an extended network of smaller ports and harbours spread throughout the coastal area of East Macedonia – Thrace. These are used for the transportation of passengers and goods within and outside the area, as well as the docking of fishing and tourist boats. In this network, there are a total of 20 ports and fishing shelters.

There are plans for the further development of infrastructure to support the shipment or storage of goods from the Greek, Turkey and Bulgaria in the municipality of Iasmos, which is strategically located between three major ports (Alexandroupoli, Porto Lagos and Kavala ports).

6.4.6.4 Airports

The International Airport "Macedonia" (Thessaloniki Airport) in Central Macedonia, is the second largest airport in Greece, connecting Thessaloniki with other Greek cities and a number of international destinations.

131 Port Authority of Thessaloniki

132 Since October 2002 the old port of Kavala is not used commercially. Instead, the “Filippos B” port in N. Karvali is used for that reason.

In East Macedonia – Thrace, the air transport infrastructure has limited connections and is mainly used to connect the area to major cities in Greece. There are two airports: the airport of Alexandroupoli that mainly serves municipalities between Alexandroupoli and Komotini and the airport of Kavala (located at Chrysoupoli), that serves all municipalities between Kavala and Xanthi. In the study area, near the settlement of Amygdaleonas (municipality of Kavala) there are installations of the Greek Air Force, but they are no longer in use.

In West Macedonia there are two small airports one in Kastoria (Argos Orestiko) and one in Kozani that connect the region to Athens.

6.4.6.5 Water and Sanitation

In Greece 95% of households are connected to the water mains and 90% of the population is connected to sewage systems. In the four urban centers of Kavala, Xanthi, Komotini and Alexandroupolis, there are Water supply and Sewerage (DEYA) companies, in addition to biological and sewage treatment facilities.

Within the socioeconomic study area 99% of surveyed households reported having piped water inside their home with only one household in Kavala reporting water supplied from a well. All surveyed households in the study area have a flushing toilet, however, there is a marked difference in the types of public sanitation systems in the three regions.. In East Macedonia – Thrace, the majority of surveyed households in all municipalities use traditional septic tanks, with the exception of Kavala municipality, where almost all households (96%) are connected to the public sewerage system. In Central Macedonia, surveyed households in Nea Zichni, Oreokastro and Edessa reported similarly high numbers of households connected to the public sewerage system. In surveyed households in Naousa 78% of surveyed households use a septic tank and 22% are connected to a public system. Pella and Skydra have a higher number of people connected to the public sewerage system (40% and 47%). In Chalkidona just 6% of households are connected to the public sewerage system. All remaining municipalities of Central Macedonia only use septic tanks.

Most of the settlements along the route are provided with potable water through water abstraction works at springs or wells/boreholes; a handful have piped water from further afield. During the

2013 field study, lack of good quality potable water was reported in two settlements, Probatas (municipality of Serres) and Meleti (municipality of Komotini). This was a big problem in Meleti and according to focus group participants "the potable water is dirty, full of sediment", but people in the settlement "drink it out of necessity"[133].The detailed socioeconomic maps in *Annex 4.6* include information on water source by settlement as reported by heads of communities. Water abstraction or use is registered with the Decentralised Administrations (regional level) and there is a recent Joint Ministry Decision (JMD No 150559 of 16 June 2011) requesting that all existing water uses must be registered by the 17th of December 2012[134], however, the results are not publicly available yet.

6.4.6.6 Irrigation

In Greece more than 100% of the groundwater available for annual abstraction was reportedly extracted in 2007[135]. This means that Greece is seriously over-stressing its groundwater resources by over-exploiting groundwater beyond ecological limits. Water is mainly abstracted for irrigation, cooling purposes and public water supply.

Freshwater resources are unevenly distributed in Greece with areas in the west of the country receiving high levels of precipitation (900 mm) whereas areas in the southern and central mainland, Aegean islands and Crete, are in danger of desertification[136]. Agriculture is the most significant water consumer, accounting for 87% of freshwater consumption and is of concern in localised areas threatened by desertification. This is due to higher temperatures and higher evapotranspiration, which make average water use per hectare higher in southern European countries compared with the rest of Europe[137].

According to estimates provided by ELSTAT, total irrigated areas (both collective and private), occupy roughly 44% of cultivated areas in Greece. The methods of irrigation are distributed as

[133] Focus Group Farmers, ASPROFOS, 2013. The farmers brought us a glass of water but only to see it and advised us not to drink "unless we wanted a stomach ache".
[134] According to the JMD after its last ammendment (110613/2012), the period in which water users must submit all relevant paperwork and application to gain legal rights on their water use ended in December 2012.
[135] European Union 2010, Environmental Statistics and Accounts in Europe.
[136] OECD 2000, Environmental Performance Reviews.
[137] European Union 2010, Environmental Statistics and Accounts in Europe

follows: 25% surface irrigation, 53% sprinkler and 22% drip irrigation[138].

After the incorporation of EU Directive 91/676 “for the protection of waters from nitrate pollution caused by agriculture” (arising mainly from the use of nitrogen fertilisers) into Greek legislation in 1997[139], specific areas were designated as vulnerable, including the regional unit of Thessaloniki and the basin of the Strymonas River[140], As part of its agro-environmental policies, Greece has set up and enacted Action Plans. These aimed at protecting zones designated as vulnerable to nitrate pollution and incorporating a set of rules and obligations for farmers situated within the vulnerable zones, including the application of a threshold for maximum nitrogen fertilisation of soils.

Generally, the region of East Macedonia - Thrace does not face any water shortage issues and has surplus water, taken mainly surface water resources such as the rivers of Evros, Nestos and Strymonas. This situation is predicted to continue with recovery or transfer of water taken from the dams of river Nestos in the eastern part of the region. However, issues of water shortage were reported in specific settlements, i.e., Neos Xerias (municipality of Nestos), Koptero (municipality of Iasmos) and Meleti (municipality of Komotini), where boreholes used for irrigation are superficial.

Water in Central Macedonia is not seen as an issue as current needs are being met. However, there remains uncertainty about future supplies as a large amount of surface water comes from the Former Yugoslav Republic of Macedonia, so the region is dependent on the water management policy of this country. Also, as the management of water resources in the region of Central Macedonia is quite complicated, hydrological estimates of water quantity can sometimes be misleading[141]. In the study area, water shortage was reported in the settlements of Melissochori and Pentalofos (municipality of Oreokastro) and Evaggelistria (municipality of Lagada), where the main water source is from wells. These settlements are forced to produce crops that do not require a lot of water such as cereals.

The most extensive irrigation network in the study area is located in the municipality of Serres, where the pipeline route crosses high quality agricultural farmland. Probatas has the second largest irrigation network in Greece, as there is an area of rice cultivation that demands an

[138] Ministry for the Environment, Physical Planning and Public Works (2008). National Reporting to the 17th Session of the Commission for Sustainable Development (UNCSD 17).
[139] Joint Ministerial Decisions (JMD) 16190/1335/1997 (Government Gazette /OJG B519/1997), JMD 19652/1906/1999 (OJG B1575/1999) and JMD 20419/2522/2001 (OJG B 1212/2001).
[140] Ministry for the Environment, Physical Planning and Public Works, op.cit.
[141] Operational Programme of Macedonia – Thrace 2007-2013.

abundant supply of water. Water is taken from an artificially created reservoir into a series of channels that are flooded in March for the first stages of rice production. After that, water is slowly drained, as the rice is cultivated until September when the crop is harvested. Around the settlements of Mitrousi and Krinos the system of irrigation is highly sophisticated, as farmers have invested large sums of money to install electricity specifically for the purpose of pumping water from bore holes into complex irrigation systems.

An extensive irrigation network is also located in the municipalities of Chalkidona and Pella. In Chalkidona, the proposed pipeline route crosses high quality agricultural farmland that utilises an extensive irrigation network and runs between the local communities of Gefura, Valtochorion, Parthenion and Mikro Monastirion. The irrigation network was built during the 1990's and is formed by an underground network of primary and secondary plastic pipes, installed 2.5 and 1 m below ground level (respectively). The primary pipes are laid in parallel at a distance of 500 m from each other with a diameter of 50 cm. The secondary pipes are perpendicular to the primary network and have a diameter of 15-20 cm.

Figure 6-118 Adjacent Irrigation Dike and Dam in the Settlement of Monoklisia (municipality of Serres)



Source: ASPROFOS Field Survey (2013)

In all other municipalities within the socioeconomic study area in Central Macedonia, the prevailing type of irrigation is groundwater fed from boreholes (see **Figure 6-119** and *Annex 4.6*). This type of irrigation is also particularly common in the peach cultivating area of Skydra and Pella municipality (Polla Nera, Agios Loukas, Liparo, Rizon, Kalivia, Plevroma, Loutrochori, Petrea, Aspron settlements). In this area, individual investment by landowners is high, as the boreholes, pumps, tanks and connected irrigation system (sometimes above ground, sometimes drip irrigation) are almost always built by the owner of the land and are private. Sprinkle irrigation with private boreholes prevails in Ptolemaida Basin, where corn is the main crop, while in Purgoi settlement (Eordea municipality) the main crop is apple trees and farmers use drip irrigation with boreholes.

Figure 6-119 Borehole irrigation system in Skydra municipality



Source: Social Survey for the TAP Greece ESIA (2011)

In the west of the socioeconomic study area, from the municipality of Kastoria to the settlements of Agia Kiriaki and Oinoi near the Albanian border, there is almost no irrigation network and river fed irrigation is confined to the sides of the river. In this area they mainly cultivate wheat and other arid cultivations, such as cereals.

The Local Organization of Land Reclamation (LOLR) manages all public irrigation projects considered important locally and the General Organization of Land Reclamation (GOLR) manages projects that are considered of general importance. Both authorities are under the supervision and scientific support of the Land Reclamation Directorates in the Regional Entities. Irrigation in the rice cultivation area close to the settlements of Probatas and Monoklisia

(municipality of Serres) is managed by the LOLR, which has an office in Probatas. A key informant interview conducted with a representative of Probatas LOLR indicated that although irrigation is crucial to local crop production the network is old and in need of maintenance.

Further detail on the irrigation systems used within the socioeconomic study area is presented in *Section 1.4* of *Annex 6.3*[142].

6.4.6.7 Waste Management

Waste management in Greece is aligned with EU legislation and based on two general legislative frameworks aim at providing an integrated management system. These are:

- Joint Ministerial Decision (JMD) 50910/2727/2003 The "National Plan for the Management of Non-Hazardous Waste"; and
- JMD 8668/2007The "National Plan for the Management of Hazardous Waste"

General frameworks, objectives and priorities regarding waste management are set at a national level and every Region should draft a Regional Plan for Solid Waste Management according to the National Plan for the Management of Non Hazardous Waste. The provisions of the approved Regional Plans for the study area are:

- East Macedonia – Thrace: One sanitary landfill in each one of the Regional Entities of Evros, Rodopi, Xanthi Kavala, and Drama; a number of waste transfer stations in each Regional Entity (i.e., 5 in Evros, 2 in Rodopi, 2 in Xanthi, 4 in Kavala and 2 in Drama).
- Central Macedonia: Two sanitary landfills and seven waste transfer stations in the Regional Entity of Thessaloniki; one sanitary landfill and two waste transfer stations in the Regional Entity of Serres; three landfills in the Regional Entity of Serres; one sanitary landfill and two waste transfer stations in the Regional Entity of Imathia.
- West Macedona: One sanitary landfill located in Kozani municipality.

[142] Anecdotal evidence from interviews undertaken during the 2011 field trip suggest that there is no limitation or scarcity of freshwater resources within the study area.

Construction waste management is regulated by the MD. 36259/1757/E103/2010 “Measures, conditions and plan for the alternative management of construction waste”. Waste collection is the responsibility of each municipality and waste is collected from each settlement by municipal garbage tracks and transported to a landfill. In Central Macedonia there are 11 sanitary landfills, 1 in the municipality of Serres and 1 in the municipality of Lagada. East Macedonia – Thrace is covered by 7 sanitary landfills, including the sanitary landfill sites of Kavala, Topiros, Komotini and Alexandroupoli. In West Macedonia there is only one sanitary landfill covering all of the West Macedonia Region, located in Kozani municipality.

In the socioeconomic study area, the majority of settlements have their waste collected and disposed of by municipalities. Five municipalities reported dumping as a waste disposal method (Agia Paraskevi in Doxato municipality, Kosmio and Itea in Komotini municipality, Vafeika in Avdira municipality and Vaniano in Topiros municipality). While illegal dumping was a common practice until recently, only two settlements, Nea Messimbria (Chalkidona Municipality) and Liparon (Pella Municipality) acknowledged the existence of such sites in their area. However, both were mentioned as inactive and “closed”. Also, in the municipality of Kavala, 100% of the surveyed households dispose waste themselves (e.g. dig a hole), while 1 household in the municipality of Topiros reported taking waste to a land fill themselves.

There is no system in place for the disposal of hazardous waste such as pesticide packaging. It is common practice to burn empty pesticide bottles or simply dispose of them in the field. This is especially common in the peach tree cultivation area of Skydra and Pella municipality (KP 410 - 429), were there is high and frequent use of pesticides.

6.4.6.8 Energy

The systematic exploitation of lignite deposits in Northern Greece and the Peloponnese was the main priority of domestic energy policy after the oil crises in the 1970`s. The major energy centre in northern Greece is the region of West Macedonia which hosts the bulk of the lignite resources in the country and generates more than 60% of the total electric power of Greece. The regions of Central Macedonia and East Macedonia - Thrace are major consumers of energy, primarily due to the existence of large urban centres and areas of industrial, commercial, agricultural and tourism activities. The main energy needs of Central Macedonia and East Macedonia - Thrace

are covered by the electric power plants of the Public Power Corporation (PPC) that are located outside of the jurisdiction of these regions (most of them in West Macedonia). Apart from lignite resources, a large turf deposit is found in East Macedonia – Thrace, in the area of Philippoi (municipality of Kavala) and there are plans for its future exploitation by the PPC.

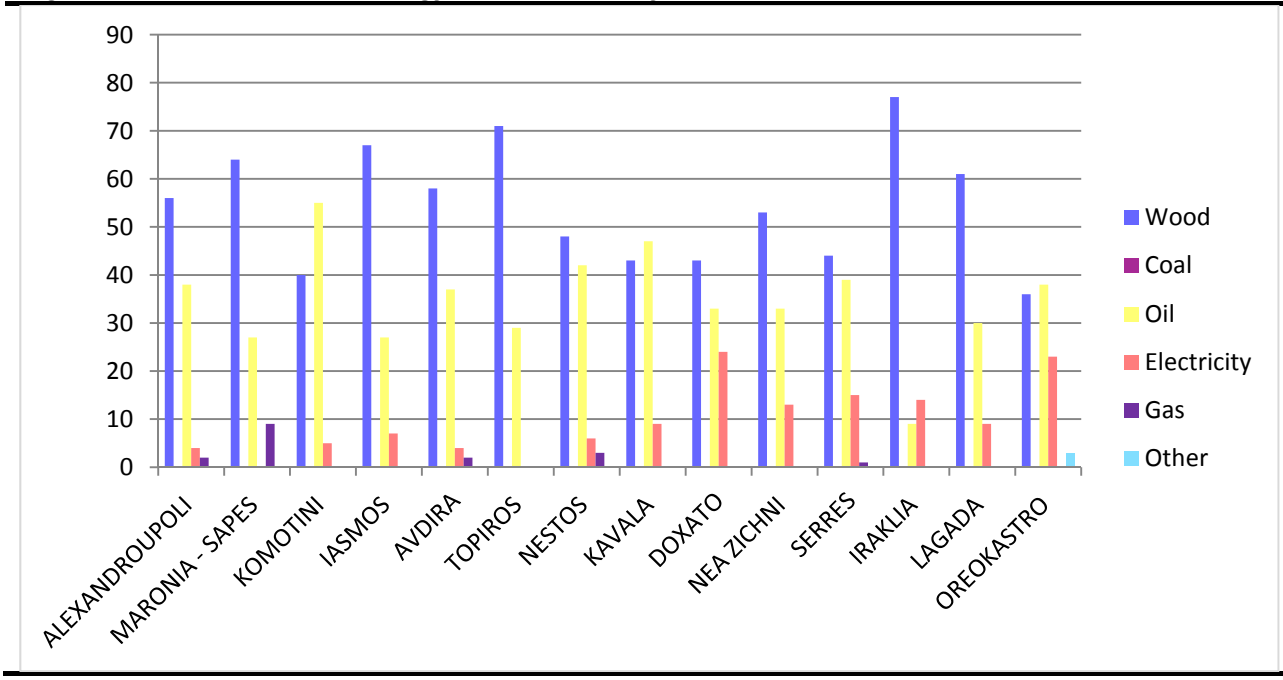
Hydroelectric power is provided by 2 large-scale hydraulic works (dams) that are operated by the PPC, along the river Nestos in Drama (Thisavros and Platanovrisi), outside the study area. Also, a gas-powered thermoelectric power station is located in the industrial zone of Komotini, providing approximately 10% of the country's capacity.

In the region of East Macedonia - Thrace there are plans for environmentally friendly energy production utilizing diverse resources, such as natural gas, hydropower stations, wind and geothermal energy[143]. The decision to introduce natural gas was taken in 1986 in order to reduce the dependence on oil, protect the environment and enhance the competitiveness of the Greek economy. Gas consumption is slowly increasing[144] with market share currently 8%, but this is expected to significantly increase by 2020.

Within the socioeconomic study area, energy used for basic household purposes (heating and cooking) is predominantly wood, electric and oil (see *Figure 6-120* and *Figure 6-121*) In TAP Greece East the traditional wood stove or fireplace is mainly used for heating (between 36% and 77% of households across municipalities), while electricity is preferred for cooking (53% - 91% of households). The only exception to this is in the forested area of Avdira, where the majority of surveyed households rely on firewood for cooking (91%) in addition to heating (58%). The only households that reported having no heating were found in Nea Zichni (6%). The settlement of Meleti (municipality of Komotini) is the only one in the study area that has no access to electric power, which constitutes a major problem for its residents.

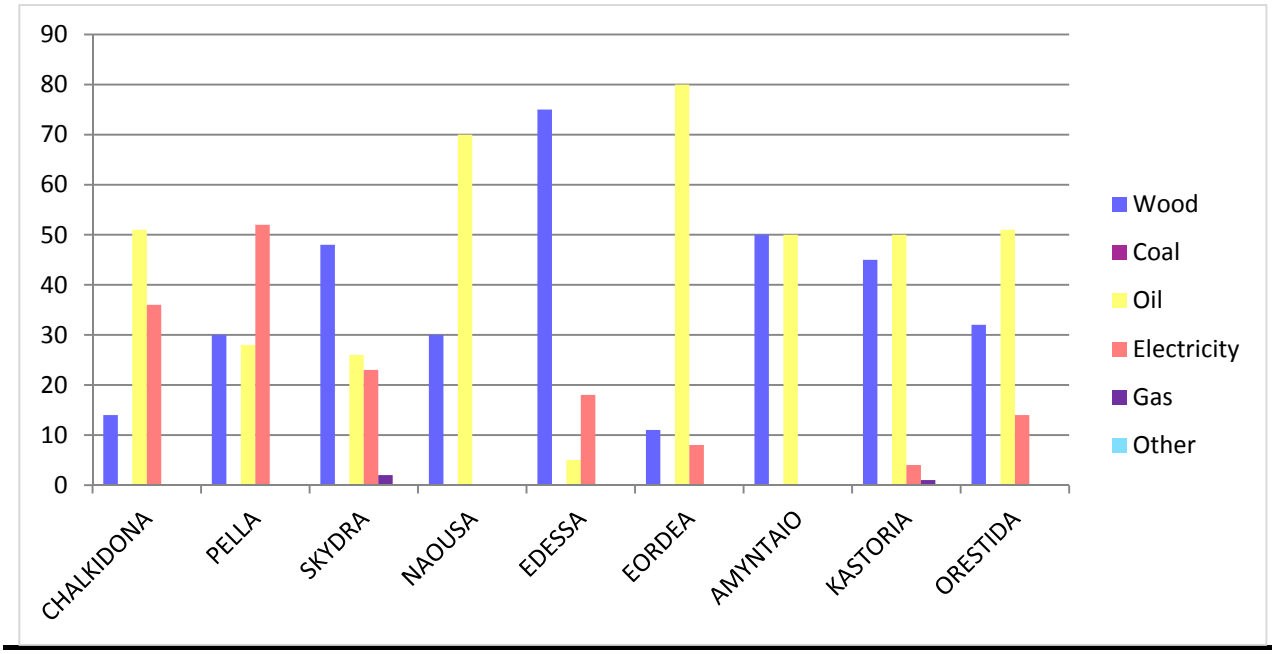
[143] Due to the climatic and geomorphology characteristics, East Macedonia - Thrace includes areas that promote sustainable economic operation of wind farms (mainly in the prefectures of Evros and Rodopi). The plains of Central and East Macedonia - Thrace are also rich in geothermal sources suitable for power generation, nevertehless, no electric power is produced from geothermal resources in Greece up to present.
[144] IEA Energy Statistics on the Web: http://www.iea.org/statist/index.htm

Figure 6-120 Household Energy Use in the Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-121 Household Energy Use in the Study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

Gas is used by a small proportion of the population in TAP Greece East, mainly in East Macedonia – Thrace (0.8% - 8.5% of surveyed households), with the exception of the municipalities of Maronia - Sapes and Topiros in East Macedonia – Thrace (20% and 13.5% of

the surveyed households respectively). However, during the field study, 95% of all surveyed settlements in both regions in TAP Greece East, stated that they would prefer to use gas if they had the opportunity and requested information about whether the project would enable them to have access to gas.

The national natural gas transmission system constructed by DESFA (former DEPA) crosses the study area from Kipoi to Thessaloniki. The previous experience of the local communities with the DESFA pipeline was negative and as participants in focus groups commented, “we did not benefit anything, our fields lost in value, not all owners were fully compensated and not all disputes were resolved”. As a consequence, participants in community meetings throughout the study area had serious reservations about the potential impacts of the proposed project. Participants stated that they are concerned that their land will lose value and production will be undermined for a second time, in addition to wanting guarantees that mitigation measures will be implemented (see *Section 8.11.2.2.1*). In many instances, community members were reassured by the stakeholder engagement process and the information provided during community meetings. Further data concerning the relevant issues raised during community meetings are provided in *Section 7 (Stakeholder Engagement).*

In TAP Greece West Surveyed households in West Macedonia heat their homes and cook using either wood or oil. In the forested municipality of Edessa, 76% of households rely on firewood to heat their homes. Households in Central Macedonia are much more reliant on electric heating (19%-53%) and electric stoves (47%-91%). Naousa is the only municipality in Central Macedonia where no surveyed households used electric heating, but the majority of homes (73%) used electricity for cooking. None of the surveyed households in the socioeconomic study area use gas for heating, and only a small proportion in Chalkidona, Skydra, Naousa and Edessa use gas for cooking (2%, 8% and 18% and 14%). Coal for heating was only used in a very small number of households in Skydra and Kastoria (2% and 1%) and it is used for cooking in 3% of surveyed households in Edessa.

Renewable energy projects (RES) or plans, especially small-scale photovoltaics and wind farms, are scattered throughout the Project area. The application of new RES projects has seen a considerable increase in the last few years as a result of the favorable buy-in tariffs established by the state for RES-electricity. The aim of this was to comply with the EU requirements of increasing the percentage of renewable energy in the country’s energy mix. RES applications are

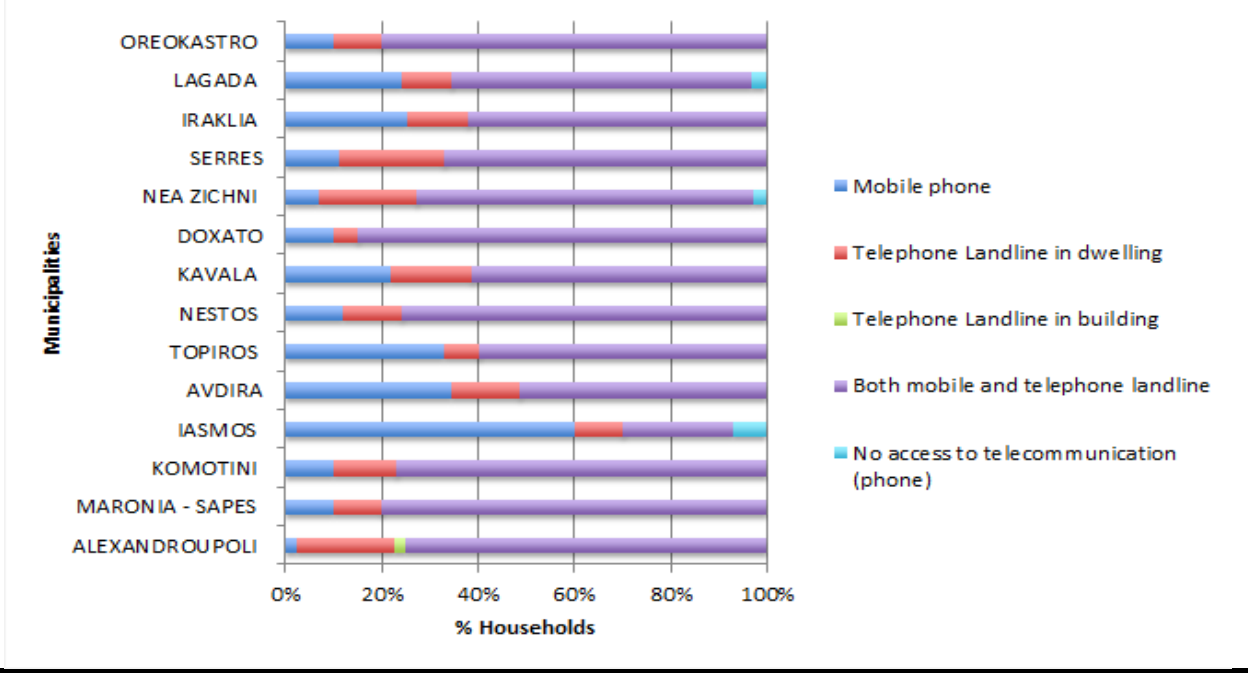
primarily managed by the Regulatory Authority for Energy (RAE), except for very small PV projects which are handled by the Public Power Corporation (PPC). For communication purposes, RAE prepares and publishes maps showing pending RES applications (in various stages of development). Data from these maps are shown in the *Annex 4.6- Land use and Socioeconomic Environment*, along the proposed pipeline route. However, several of the RES projects shown will not be constructed, as they may fail the evaluation by RAE or they may not succeed to raise the necessary funds. The development of these proposals, as well as potential restrictions to pipeline construction within the concession area of wind farm near the Albania border will need to be monitored by TAP AG as the Project progresses. Where the pipeline is within proximity, safety stand-off distances are likely to be required from individual wind turbines.

6.4.6.9 Telecommunications

The level of supply and quality of telecommunication services has improved due to the modernisation of the current network (digitalizing of communication services, etc.), however, it is estimated that the regional demands for modern telecommunication infrastructure will increase.

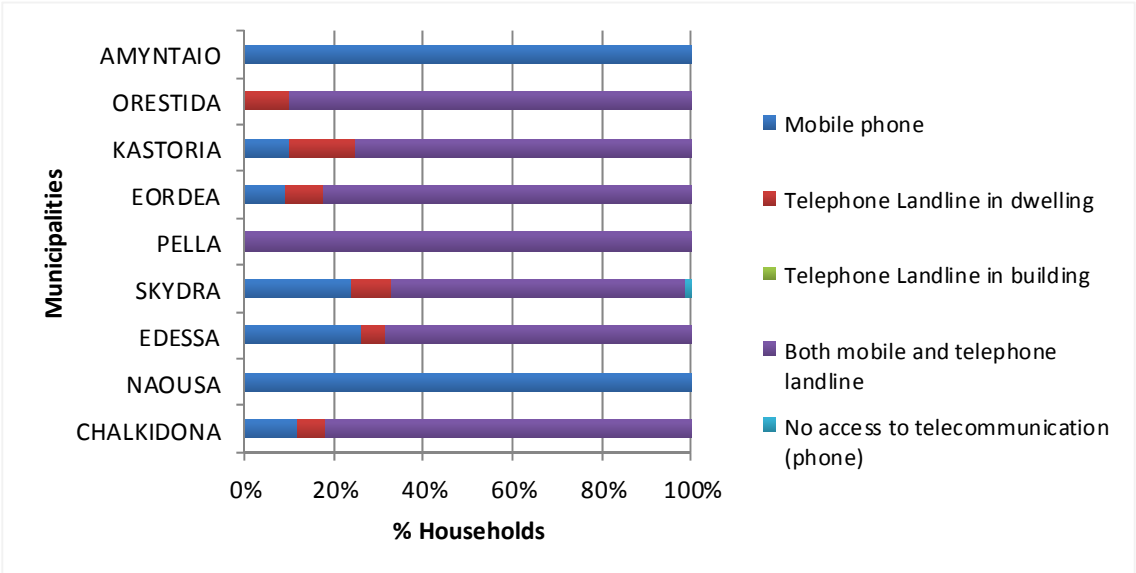
Historically, the Region of East Macedonia-Thrace had one of the lowest ratios of telephone connections and new technology devices in the entire country, which had been a serious disincentive to expand commercial activities in one of the most sparsely, populated parts of the Greek territory. However, according to the results of the field survey, every settlement in the study area has fixed telephone lines, with internet access and mobile phone coverage is widespread. Only six surveyed households reported having no access to telecommunications. These households were in the municipalities of Iasmos, Iraklia, Nea Zichni Lagada and Skydra. All other households reported having a mobile phone, a landline inside their home or both. Exception to this are the municipalities of Naousa and Amyntaio, where 100% of surveyed households have no fixed telephone line, as they prefer to use a mobile phone. *Figure 6-122* presents telecommunication infrastructure per municipality in the study area.

Figure 6-122 Telecommunication Infrastructure in the Socioeconomic study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-123 Telecommunication Infrastructure in the Socioeconomic study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

6.4.7 Traffic and Transport

6.4.7.1 Regional Overview

Transport, and the road network in specific, has been historically seen as a major contributor to communication and economic development for the Regions of Western, Central, East Macedonia, and Thrace, connecting the regions with the main urban centres in Greece and the developing Balkan countries in the north and Turkey to the east.

A key element of the road network in the region is Egnatia highway (European Road E90) and its vertical axes. The construction of Egnatia highway is the most significant road network project of modern times in Greece, crossing four regions (*East Macedonia and Thrace, Central Macedonia, West Macedonia* and *Ipiros*) and providing the infrastructure, through its interlink with the National Road Athens – Thessaloniki, for the connection of major urban and commercial centres from Alexandroupolis to Igoumenitsa. Egnatia is linked with the ports of Igoumenitsa (West Greece), Thessaloniki, Kavala and Alexandroupoli. At a national level, the Egnatia highway is a major development axis in Northern Greece and on a European level, the -highway links the major industrial centers of the West with those in the East and is part of the Pan-European Roads IV (connects Vienna to Thessaloniki), IX (connects Helsinki to Alexandropoulis and X (connects Berlin to Thessaloniki).

The Egnatia highway is crossing the region of Eastern Macedonia and Thrace (from Strymonas river to Kipoi) with a 246 km long section. The vertical axis, Ardanio - Ormenio (124km), is of strategic importance and major connection with Bulgaria. The two other vertical axes, Xanthi – Greek-Bulgarian borders (49 km) and Komotini – Greek-Bulgarian borders (23 km), which are currently under construction and study respectively, are expected to further increase the interconnection and economic relations between Greece and Bulgaria. The section of Egnatia highway that runs through Central Macedonia is 191 km long and extends from Polimylos to Strymonas. In the region of Western Macedonia the highway is 112.5 km long. The two vertical axes, No 45 Siatista – B/S Krystallopigi (81 km) and No 50 Florina – B/S Niki (77 km), connect with major road axes in Albania and FYR Macedonia respectively..

Apart from Egnatia highway, the rest of the road network in the regions is classified as national (primary, secondary and tertiary), provincial and communal / agricultural roads. In the regions

Central Macedonia, Eastern Macedonia and Thrace , the main road transport axes in the project areas are generally in very good condition and well maintained and provide a very good access along the project area. The mountainous regions are also connected with a well-developed road infrastructure. In the region of West Macedonia the improvement of the existing network has been earmarked as priority for the Regional Authorities, as the primary roads are considered insufficient to carry the traffic load at peak hours while the secondary network is considered complex and not user-friendly.

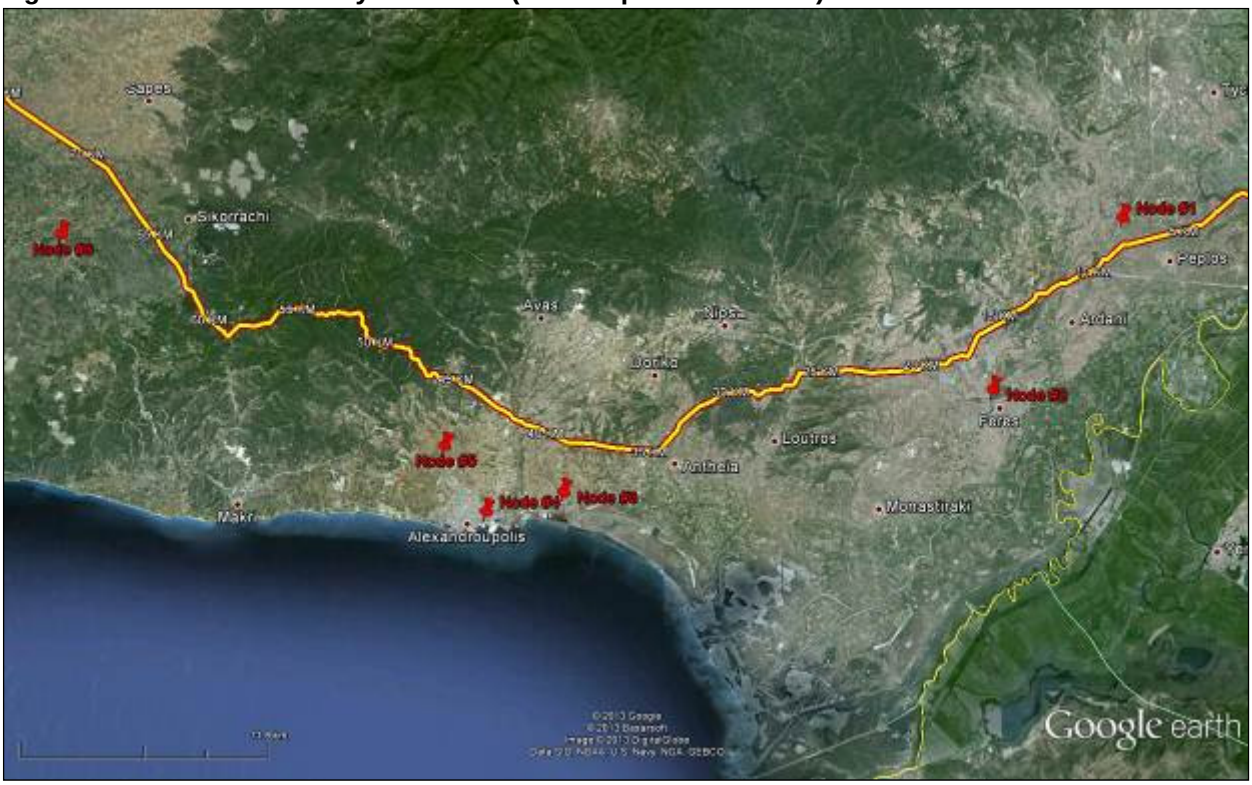
6.4.7.2 Traffic Study

For the purpose of the ESIA a traffic study was undertaken to gain a better understanding of present traffic conditions in the Project area in order to support the assessment of impacts on traffic and transportation in the regions along the pipeline route. The Project area was divided in two major sections, the East Section from Kipoi to Thessaloniki and the West Section from Thessaloniki to the Greek/Albanian border. A further split of the East Section followed, resulting two sub sections, one from Kipoi to Komotini and one from Komotini to Thessaloniki. For each one of these three sections a separate traffic study was conducted but the exact same methodology and approach was followed regarding all the traffic parameters.

The traffic surveys focused on key nodes that were selected based on the Logistics Reports (*GPL00-ENT-100-F-TRP-0003* for the East Section and *GPL00-ENT-100-F-TCE-0001* for the West Section) provided by ENT which identifies likely construction transportation routes and desktop identification of road sections and junctions with regional or local road network functions potentially vulnerable to Project construction traffic.

Three sets of traffic nodes results will be presented to reflect the three different studies undertaken. The selected traffic survey locations and the rationale behind their selection is illustrated in the following figures (*Figure 6-124, Figure 6-125, Figure 6-126*) and tables. Transportation and vehicle movement assumptions in these tables were based on the Logistics Reports.

Figure 6-124 Traffic Survey Locations (From Kipoi to Komotini)



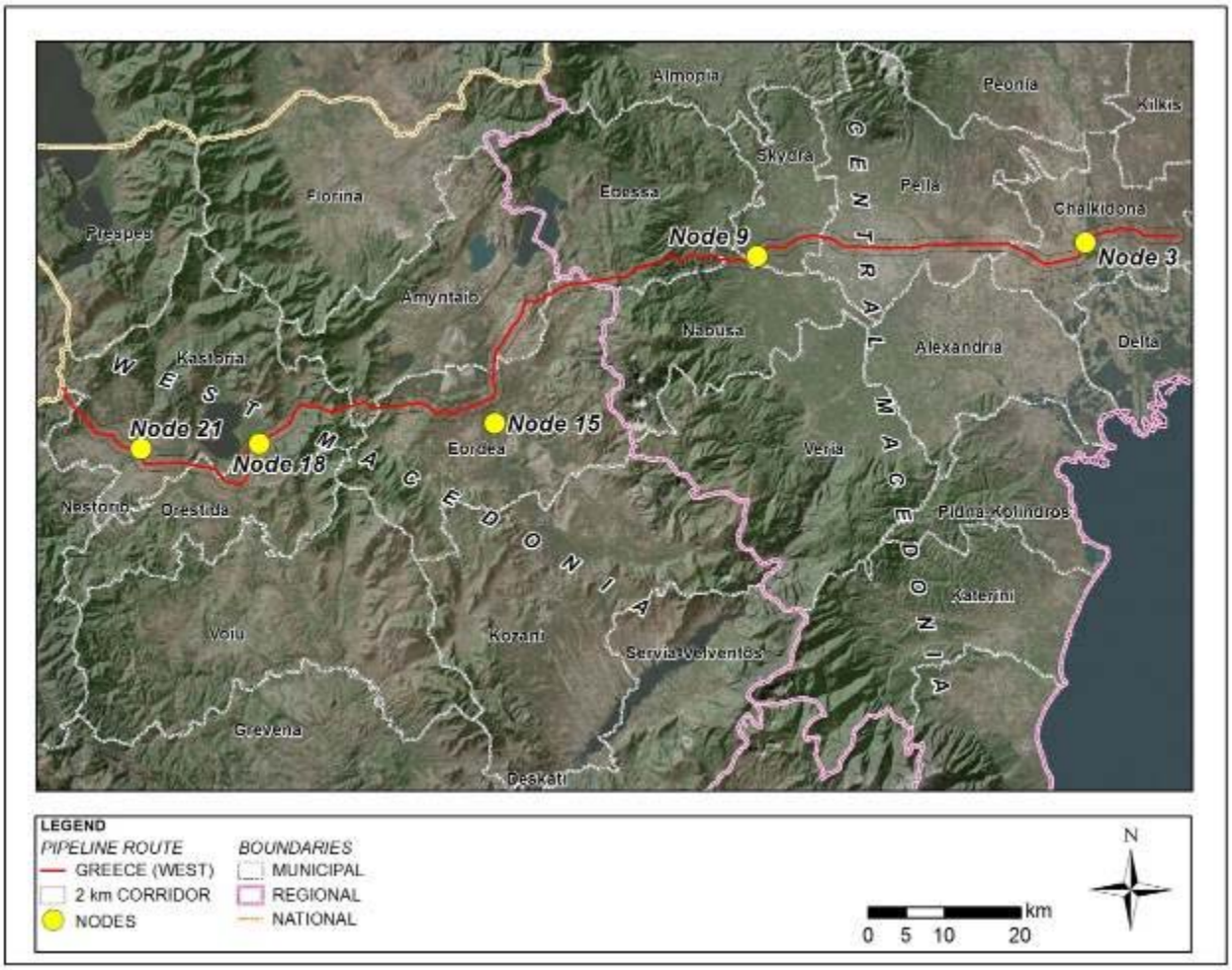
Source: Exergia (2013)

Figure 6-125 Traffic Survey Locations (From Komotini to Thessaloniki)



Source: ASP (2013)

Figure 6-126 Traffic Survey Locations (From Thessaloniki to Greek/Albanian border)



Source: ERM (2012)

Table 6-118 Traffic Survey points and rationale for selection (From Kipoi to Komotini)

Traffic node #	***Description***	***Rationale/Comment***
1	Section E75 -Tavri	Traffic junction of a branch of Egantia Highway with acess road to GCS00
2	Section Alexandroupoli-Feres-Ardanio	Traffic junction outside Ferres with transport road to pipeyard PY01
3	Section Alexandroupoli-Apalos-Amfitriti	Traffic junction outside Ferres with transport road to pipeyard PY02 Alexandroupolis
4	Alexandroupolis port	Road connecting the main pipe delivery port with storage yeards along the pipeline route
5	Alexandroupolis port	Traffic junction road from Alexandroupolis (port) with branch of Egnatia Highway)
6	Mesti junction	Traffic junction south of the pipeyard PY03 Chamilo with branch of Egnatia Highway)

Source: Exergia (2013)

Table 6-119 Traffic Survey points and rationale for selection (From Komotini to Thessaloniki)

Traffic node #	***Description***	***Rationale/Comment***
1	Intersection Between exit ramp of E90 with Komotini – Alexandroupoli National Road	Entrance – Exit to Komotini. Location is in the vicinity of camp 02 near Kosmio – Komotini.
2	Regional Road of Komotini-Palaia Maronia	Generated traffic from the main pipeyard of Alexandroupolis to the camp 02 near Kosmio-Komotini
3	Exit E90 to Komotinis-Kikidio at junction Komotinis-Alexandroupolis National Road and Xanthi – Komotini National Road	Generated traffic from the pipeyard of Alexandroupolis to the pipe yard PBY05 near Vafeika/Xanthi
5	Road connecting the port of Kavala with the adjacent junction of E90	Traffic from the PY06 and camp03 at Kavala driving in east-direction to sypply pipe yards, driving in west direction to supply pipe yards.
6	Intersection between Exit ramp from E90 with Dramas-Kavalas National Road	Traffic from the PY06 at Kavala to the pipe yard PBY07 at Symvoli and PBY08 at Toumpa-Serres
7	Regional Road Pentapoli - Pethelinou	Exit from National Road Serres - Drama to pipeyard PY08/ CAMP04 at Toumpa. Close gap between traffic cound node #6 and #8.
8	Intresection between Thessaloniki – Serres National Road with Lagada - Nees Serres Regional Road	Exit from National Road Thessaloniki - Serres to GCS01
9a + 9b	Intersection between Thessaloniki – Serres National Road with Lachanas - Evaggelistria Road	Exit from National Road Thessaloniki - Serres to PY09.
10	Intersection between Thessaloniki - Serres National Road / Assiros exit road	Exit from National Road Thessaloniki - Serres to PY11.

Source: ASP (2013)

Table 6-120 Traffic Survey points and rationale for selection (From Thessaloniki to Greek/Albanian border)

Traffic node #	*Description*	*Rationale/Comment*
3	Section E86 -Valtochori	Estimated total 181'000 construction traffic movements (average 59 vehicles/hr) – local road connecting village
9	Section Skydra-Veroia	Estimated total 80'000 construction traffic movements (average 26 vehicles/hr) – regional cross roads and connected with Pipeyard 2
18	Pipe yard #4 Korissos Junction south of pipeyard	Estimated total 76'000 construction traffic movements – close to pipeyard 4 and on a main east – west connector
21	Pipeyard #5 Mesopotamia (junction east of the pipeyard)	Estimated total 31'000 construction traffic movements, but a bottleneck for transport to Pipeyard 5 on the western end of the road towards the border with Albania

Source: ENT (2012)

The traffic counts were undertaken between 4th and 8thFebruary 2013 for the section from Kipoi to Komotini, between 24th and 27th February 2013 for the section from Komotini to Thessaloniki and between 23rdand 27thApril 2012 for the section from Thessaloniki to Greek/Albanian border (average weekdays).

Each site was surveyed for one day between 0600 and 2200 hrs[145].Traffic count data for the following types of vehicles were collected:

- Motorcycle,
- Prívate cars (sedan, van, RV (e.g camper-van), etc.),
- Microbus for private use,
- Taxi,
- Small (pickup) truck,
- Medium truck (< 5 tons),
- Large truck (>= 5 tons),
- Minibus, and
- Bus

In parallel to the traffic surveys and with the aim of developing a robust traffic baseline, additional investigations were made with relevant stakeholders, such as Egnatia S.A. (the concessionaire that operates the highway) and the traffic police/emergency services related with the traffic nodes surveyed. The results of these meetings, were relevant, are also incorporated in the baseline presentation in the following sections.

[145] No overnight or weekend traffic counts were undertaken as it is not envisaged in the current logistics concept that any regular pipe movements will be undertaken during these times.

6.4.7.3 Summary of Traffic Survey Results

6.4.7.3.1 Traffic Survey Data analysis

The data from the automatic traffic counters was analyzed and the average traffic volume per direction, at each survey location, has been calculated. The following tables *Table 6-121, Table 6-122 and Table 6-123* shows the overall summary of the traffic volumes for both directions, for all the surveyed locations. The analytical traffic data collected during the survey is presented in *Annex 6.3.*

Table 6-121 Summary of Traffic Flow in Surveyed Locations (Kipoi - Komotini)

	Traffic Node	***Description***	***Vehicle count both directions***
1	1	Section E75 -Tavri	3,280
2	2	Section Alexandroupoli-Feres-Ardani	3,571
3	3	Section Alexandroupoli-Apalos-Amfitriti	10,258
4	4	Alexandroupolis port	4,695
5	5	Alexandroupolis port	2,609
6	6	Mesti junction	2,350

Source: EXERGIA Traffic Survey (2013)

Table 6-122 Summary of Traffic Flow in Surveyed Locations (Komotini - Thessaloniki)

	Traffic Node	***Description***	***Vehicle count both directions***
1a	1	Intersection Between exit ramp of E90 with Komotini – Alexandroupoli National Road	11,818
1b			3,513
2	2	Regional Road of Komotini-Palaia Maronia	4,096
3	3	Exit E90 to Komotinis-Kikidio at junction Komotinis-Alexandroupolis National Road and Xanthi – Komotini National Road	5,146
5	5	Road connecting the port of Kavala with the adjacent junction of E90	128
6a	6	Intersection between Exit ramp from E90 with Dramas-Kavalas National Road	17,345
6b			3,027
7a	7	Regional Road Pentapoli - Pethelinou	4,252
7b			454
8a	8	Intresection between Thessaloniki – Serres National Road with Lagada - Nees Serres Regional Road	11,147
8b			9,930
9a	9	Intersection between Thessaloniki – Serres National Road with Lachanas - Evaggelistria Road	55
9b			128
10a	10	Intersection between Thessaloniki - Serres National Road / Assiros exit road	2,638
10b			1,498

Source: DENCO Traffic Survey (2013)

Table 6-123 Summary of Traffic Flow in Surveyed Locations (Thessaloniki – Greek/Albanian border)

	Traffic Node	*Description*	*Vehicle count both directions*
1	3	Section E86 -Valtochori	18,036
2	9	Section Skydra-Veroia	4,132
4	18	Pipe yard #4 Korissos Junction south of pipeyard	1,990
5	21	Pipeyard #5 Mesopotamia (junction east of the pipeyard)	6,519

Source: ERM Traffic Survey (2012)

6.4.8 Education and Skills

6.4.8.1 Education Infrastructure

In Greece, education is compulsory for nine years (primary and high school education) and the Greek government is required to offer free educational services for all children ages 6 to 15 years, which are divided into the following levels:

- Kindergarden - Ages 5-6
- Elementary school – Ages 6 to 11,
- Gymnasium – Ages 12 to 15

All students wishing to continue to secondary education can either attend a Lyceum, which is comprised of 3 grades and prepares students for university or higher education institutions, or they can attend a training and/or vocational education in Technical-Vocational Educational Institutes (T.E.E).

Entry into university is secured by sitting examinations, however, the current system is under reform and has been criticised for putting too much emphasis on preparing students for higher education rather than providing knowledge.

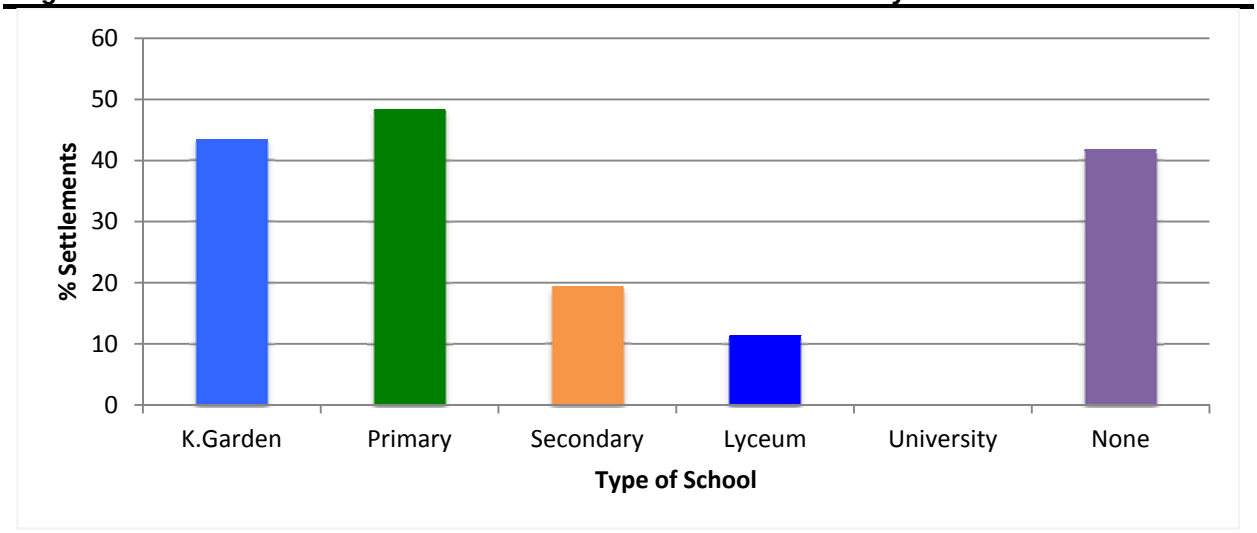
In 1997 the Greek government established Second Chance Schools, which are organized and operated through the Ministerial Decree (MD) 1003/22-07-03. Second chance schools offer accelerated compulsory education to adults who have not finished compulsory education, with the aim of addressing social exclusion of citizens that lack the skills to meet the current demands

of the job market[146]. The duration of study is at least two years and students who graduate are offered a certificate equivalent of Junior High School.

Each level of education is offered both publically and privately, except universities, which are all public institutions. In the study area, almost all of the surveyed households reported that their children attended public school. It was only in the municipality of Alexandroupoli that a small percentage of surveyed households (9%) reported having children attending a private school.

Approximately half of the settlements within the study area in TAP Greece East have a kindergarden and primary school located within the settlement (48% and 51% respectively), while that percentage is higher in TAP Greece West of approximately 69%. Very few settlements are large enough to have their own secondary school and even fewer have a lyceum. In a number of settlements, it was reported that schools had recently been closed or pending closure due to a government budget crisis. All surveyed households in the municipalities of Orestida, over 50% of those surveyed in Naousa, Edessa, Eordea, Amyntaio and Kastoria and almost half of those surveyed (48%) in the municipalities of Doxato, Kavala, Iasmos, Topiros and Lagada, reported that their children had to travel more than 4km a day using public transport in order to go to school. Educational infrastructure throughout the study area is summarized in *Figure 6-127* below.

Figure 6-127 Educational Infrastructure in the Socioeconomic Study Area



Source: Household Survey for the TAP Greece ESIA (2013)

[146] Efstathiou, I. (2009). Enhancing Students' Critical Awareness in a Second Chance School in Greece: Reality or Wishful Thinking? *Journal for Critical Education Policy Studies*, vol.7. no.1, pp. 382-405.

In 1995 the Greek government, in an effort to maintain standards, put into force a law regulating education of the Muslim minority aimed at facilitating their educational advancement . As part of this, teachers appointed in minority schools must be highly qualified, have graduate studies, foreign language skills, and a familiarity with other cultures and religious practices. In the region of East Macedonia – Thrace, there are 20 minority schools in the prefecture of Evros, 78 in the prefecture of Xanthi and 134 in the prefecture of Kavala. In the study area, 4 minority schools exist in the municipalities of Avdira (Vafeika) and Iasmos (2 in Amaxades and 1 in Koptero).

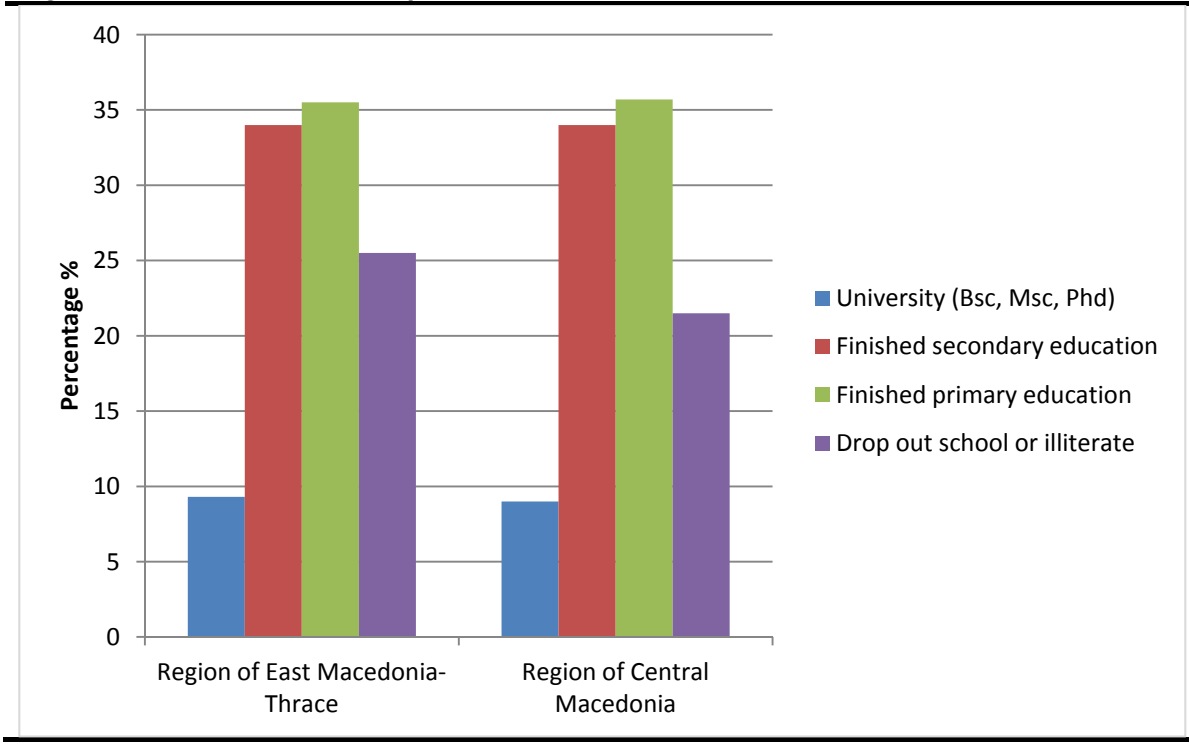
The municipality of Avdira also has a special role in terms of education, as it is the location of a number of different educational institutions that serve the population of the wider area, including a special school for blind people, a Secondary Music School and a Music Lyceum. As reported in a key informant interview, the existence of these schools is a key factor for the local community, not only providing educational opportunities, but also increasing commercial activity in the area.

6.4.8.2 Education Levels

At the regional level, Central Macedonia, West Macedonia and East Macedonia - Thrace have similar levels of educational attainment. The largest proportion of people in both regions, have only completed primary education followed by secondary education (high school only, or high school plus three years of lyceum). According to the 2001 census a large percentage of people in each region (21% - 25.5%) are illiterate or have dropped out of school. Indicatively, in the settlement of Diomidia (municipality of Avdira), it was reported that some of the inhabitants attend second chance schools in the city of Kavala[147]. *Figure 6-128* and *Figure 6-129* presents the educational profile for the regions in TAP Greece East (East Macedonia – Thrace and Central Macedonia) and in TAP Greece West (Central Macedonia and West Macedonia), as of the 2001 census.

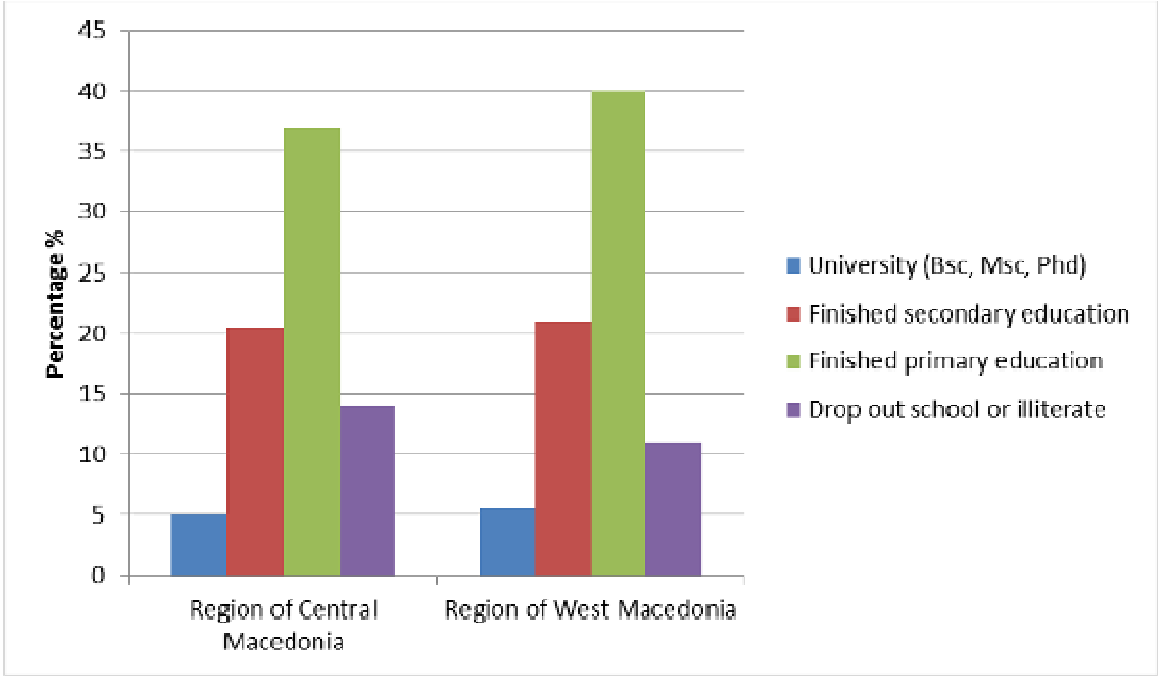
[147] There is a second chance school in each large population centre of the study area (Alexandroupoli, Kavala, Komotini, Xanthi, Serres).

Figure 6-128 Education Completion Levels in East Macedonia – Thrace and Central Macedonia



Source: Hellenic Statistical Agency, 2001 (graph includes only municipalities along the route)

Figure 6-129 Education Completion Levels in TAP Greece West (Central Macedonia and West Macedonia)

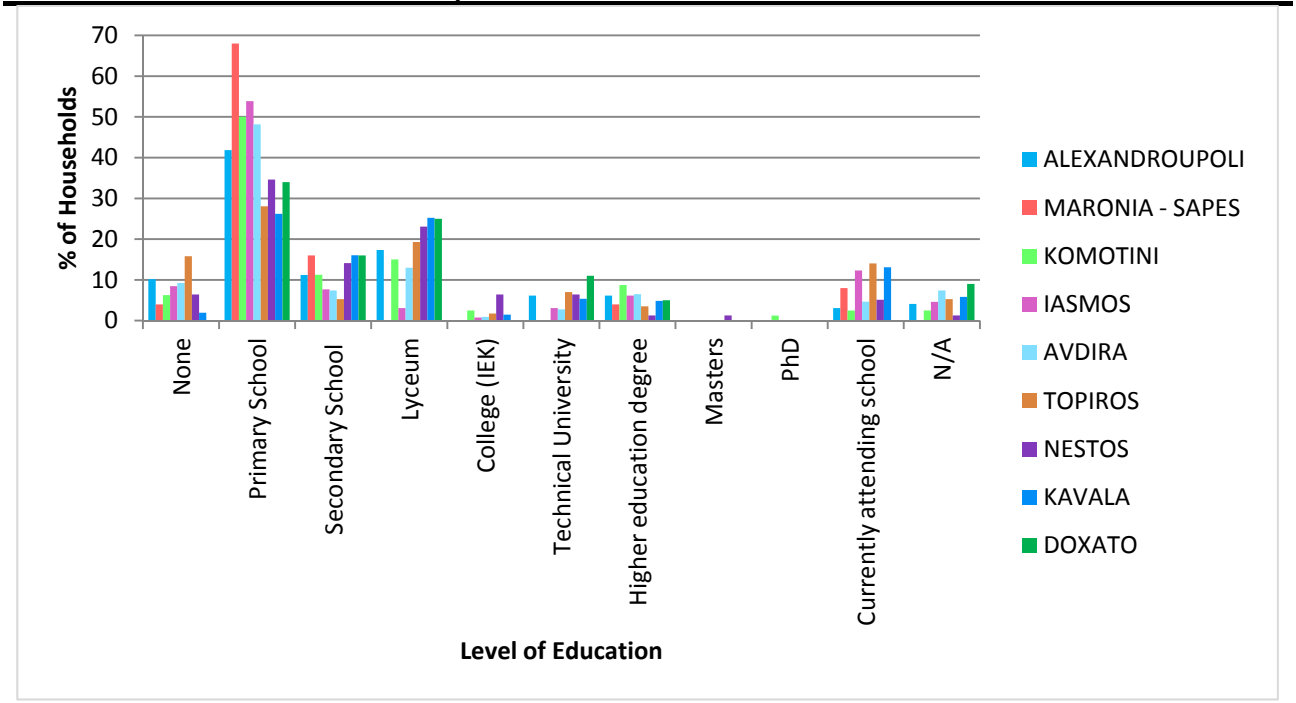


Source: Hellenic Statistical Agency, 2001 (graph includes only municipalities along the route)

Across the socioeconomic study area, household survey results found literacy rates to be relatively high (95% of surveyed households in TAP Greece East and 90.8% in TAP Greece West). In the region of East Macedonia – Thrace, the highest proportion of respondents with no formal education was reported in Topiros (16%), followed by Alexandroupoli (10%), Avdira (9%) and Iasmos (8%). In Central Macedonia, high proportions of illiterate people were reported in the municipalities of Lagada (13%), Edessa (12%), Pella (6%) Nea Zichni, Chalkidona and Skydra (5%). In West Macedonia the municipality of Orestida reported the highest proportion of houlseholds with no education (8%), followed by Kastoria (6%) and Eordea (3%).

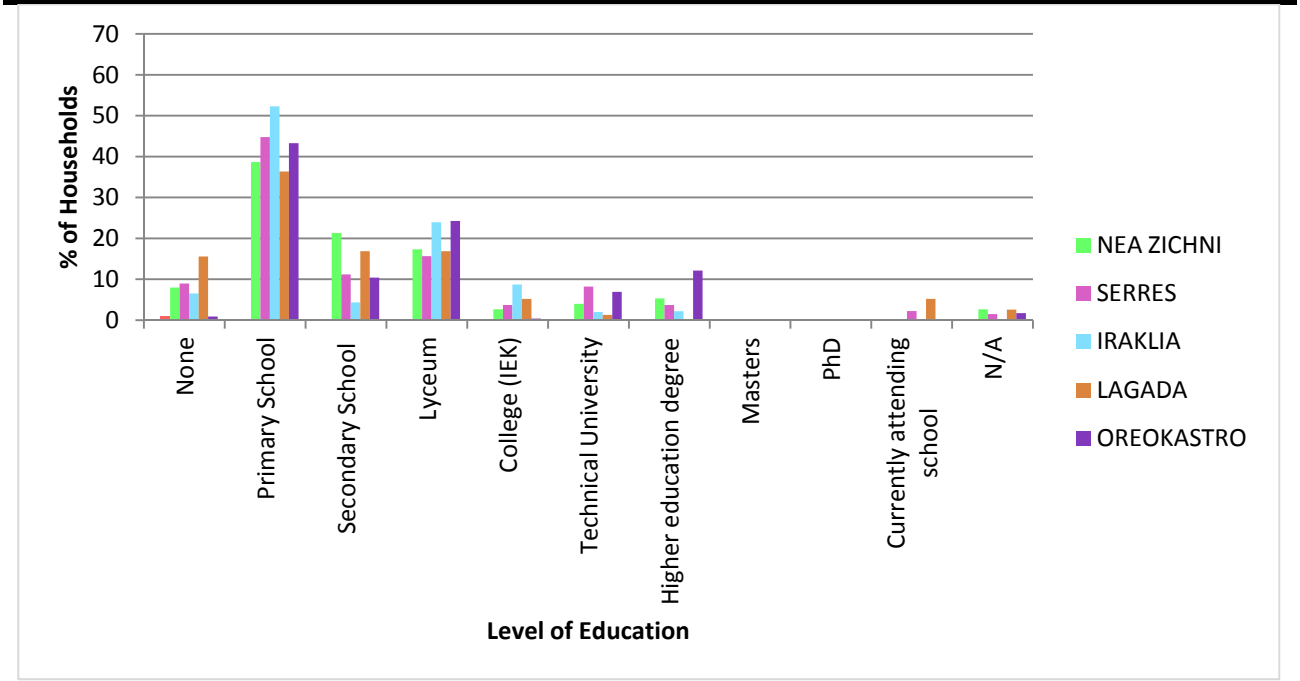
In TAP Greece East between 26% and 68% of the surveyed population in all municipalities have completed primary education, however, there are some marked local differences, with the municipalities of Topiros, Lagada and Alexandroupoli reporting high proportions of people not having completed primary education (16% - 10%). Secondary level education (high school only, or high school plus three years of lyceum) was completed by between 11% and 41% of the surveyed population in East Macedonia-Thrace and 27% to 38% in Central Macedonia. Finally, throughout the study area, only 12% of household survey respondents had a tertiary level education, whether that is college, technical /vocational college or higher education degree. A relatively high proportion of respondents with a tertiary level education were found in the municipality of Oreokastro (12%), Serres and Doxato (16% respectively) and Nestos (14%). Only two respondents reported a Masters or PhD level of education. *Figure 6-130* and *Figure 6-131* present further information on education levels by municipality for East Macedonia – Thrace and Central Macedonia in TAP Greece East.

Figure 6-130 Education Levels in the Socioeconomic Study Area in TAP Greece East (East Macedonia - Thrace)



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-131 Education Levels in the Socioeconomic Study Area in TAP Greece East (Central Macedonia)

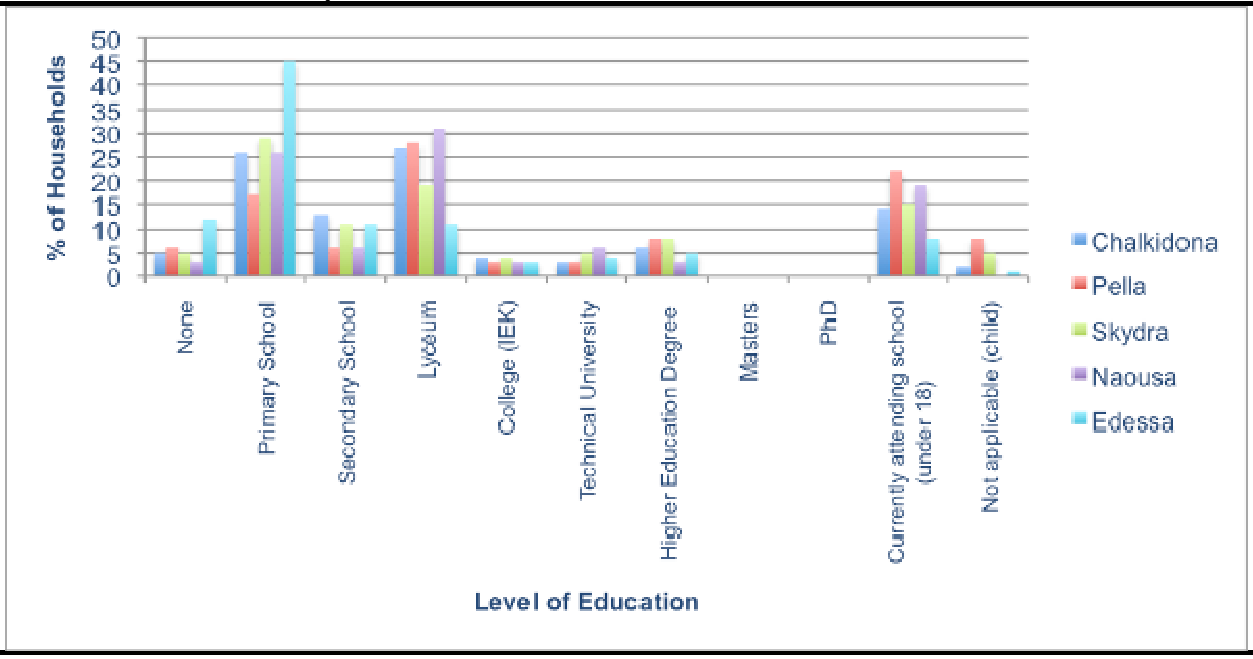


Source: Household Survey for the TAP Greece ESIA (2013)

In TAP Greece West between 16% and 45% of the surveyed population in all municipalites have completed primary education with the lowest rate in Pella municipality (16%). Secondary level education was completed by between 6% and 16% of the surveyed population. Only two respondents reported a Masters or PhD level of education. Across all municipalities in Central Macedonia between 11% and 17% of household survey respondents have a tertiary level education, whether that is college, technical/vocational college or higher education degree. In West Macedonia Orestida has the lowest number of respondents with a tertiary level education (5%). The other municipalities in the region are similar to Central Macedonia with 12% to 13% of respondents attaining tertiary level education.

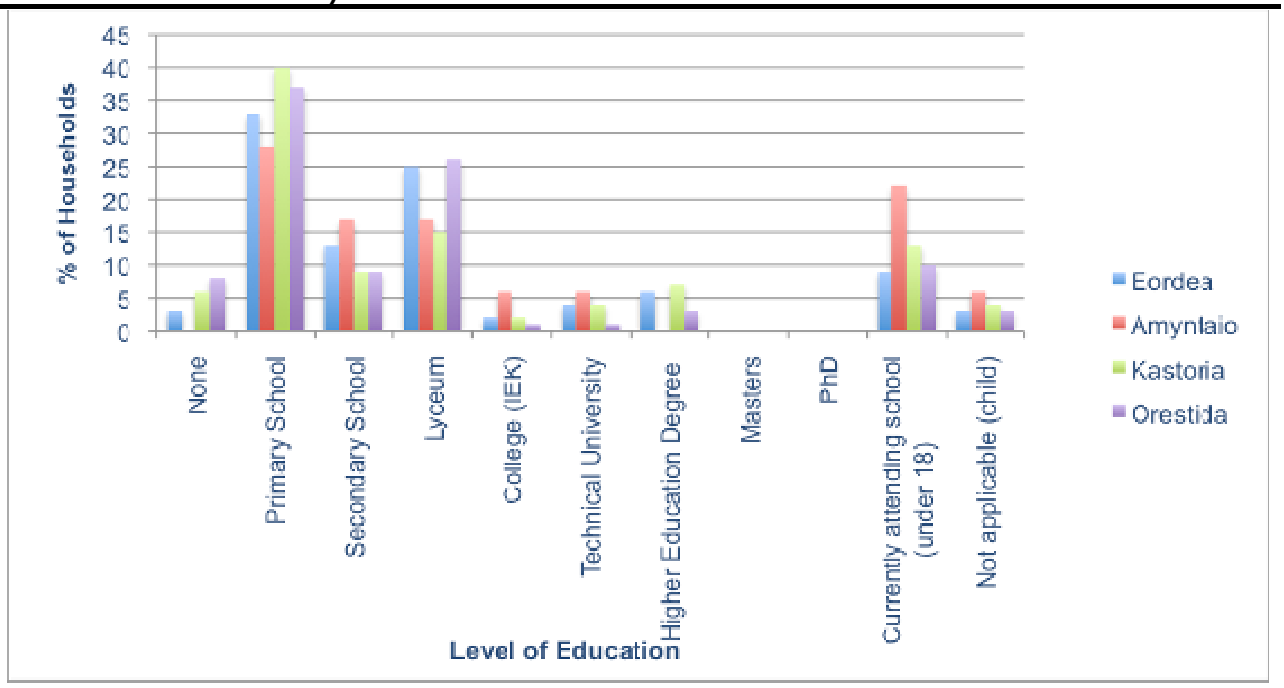
Figure 6-132 and *Figure 6-133* present further information on education levels by municipality for Central Macedonia and West Macedonia in TAP Greece West.

Figure 6-132 Education Levels in the Socioeconomic Study Area in TAP Greece West (Central Macedonia)



Source: Household Survey for the TAP Greece ESIA (2011)

Figure 6-133 Education Levels in the Socioeconomic Study Area in TAP Greece West (West Macedonia)



Source: Household Survey for the TAP Greece ESIA (2011)

In order to understand the educational context of the socio-economic study area, sixteen key informant interviews were held with teaching staff throughout the study area. It was reported in these interviews that the main reason for not pursuing further studies after compulsory education was lack of economic resources. Although schooling is free, most children of low-income families opt to enter workforce from a very young age in order to help their families. In purely agricultural settlements where no other employment opportunity is provided, young people either follow further studies with the prospect to migrate to a large population centre in the future, or start working in low-profit agricultural business with their family. Some of the findings from the key informant interviews conducted in the socioeconomic study area are presented in *Box 6-17* below.

Box 6-17 Education in the Socioeconomic Study Area

Has the educational system changed in the time that you've worked in this area?

"*There are many changes for the worse. The state gives an analytic educational programme which is the same for all schools, while it should take into consideration the different needs of each area and there should be the possibility of readjustment of the programme. In addition, the instructors have less and less support in their project and continuously reduced wages.*" **(Diomidia, municipality of Avdira)**

"There has been a drastic reduction in grants for schools, which have been cut by approximately to 50%. There have also been changes in the daily routine, management issues, issues in the book distribution. It feels like we are

continuously one step in front, two steps behind." **(Petrea, municipality of Skydra)**

"It constantly changes. Every minister of education changes the educational system following political instructions" **(Nea Mesimvria, municipality of Chalkidona)**.

What do you think does not work well within the education/training system? What changes would you make?

"*There is an emphasis and orientation towards certain courses. Also, the students aim at getting good grades and not gaining knowledge. In addition, they do not respect their elders given that now things are more liberated.*" **(Nea Zichni, municipality of Serres)**

"Kindergarden is characterised as having two positions but essentially it only has one. The building needs quite a few repairs, the roof leaks, the restroom is outside, as a result supervision is not sufficient from the kindergarden teacher when a child goes outside because she is by herself." *(Vafeika, municipality of Avdira)*

Do some people have more/less access to education/training?

"*Everyone has the same access. The ROMA who reside in the area have the same opportunity to education, however they do not attend school.*" **(Nea Mesimvria, municipality of Chalkidona)**

"Theoretically, yes, there are the same opportunities to all, but practically there are not. The reason for this is that low educational, social and economical levels do not allow people to exploit opportunities. This cannot change even within 10 years. The economic crisis and unemployment are reflected in children's mentality" **(Mesopotamia, municipality of Kastoria)**

Source: Field Survey for the TAP Greece ESIA (2011 and 2013)

6.4.8.3 Vocational Training

Vocational training in Greece is comprised of *Initial Vocational Training* and *Continuing Vocational Training*. The system accepts students from various levels of education depending on their individual skills and offers official education, which leads to an accreditation. Vocational Training Institutes (IEK) provides initial vocational training and Vocational Training Centres (KEK) provides continuing training[148].

Initial Vocational Training is supervised by the Ministry of National Education and Religious Affairs and provided by public and private IEK's, operating in the framework of the National System of Vocational Education and Training (established in 1992). There are also some IEKs under the supervision of other ministries and agencies, such as the Greek Manpower Employment Organisation (OAED). Overall, there are 29 IEK in Central Macedonia (9 private), including a public IEK in the municipality of Lagada, 9 IEK in East Macedonia - Thrace (all

[148] http://www.oeek.gr/

public), one of them in the study area, in the municipality of Nea Zichni and 5 IEK in West Macedonia (all public).

A total of 168 specialisations are taught at the IEKs including:

- Information technology - telecommunications - networks
- Financial and management services
- Transport and tourism
- Electronics - electrics - engineering
- Construction
- Industrial chemistry
- Energy - environment
- Health - cosmetics - social services
- Agriculture

Continuing Vocational Training includes all vocational training and further training activities organised outside the formal initial vocational training and education system. Its purpose is to maintain, refresh, upgrade and modernise the job skills of persons seeking employment and to help workers interested in career development.

Various ministries supervise vocational training centres (KEK) and there are a total of 268 KEK in Greece, of which 71 are based in Central Macedonia, 7 in East Macedonia – Thrace and 27 in West Macedonia, none of them in the study area.

The existing institutional framework focuses on four categories of training:

- Training of the unemployed
- Training of private-sector workers
- Training of wider public sector workers
- Training of socially disadvantaged groups

The continuing vocational training programmes include theoretical training and practical exercises in firms; the trainees are subsidised for the duration of the programme.

As it was reported by key informant interviews, many young people in the study area pursue vocational training in the IEK and KEK of the nearby centres (Thessaloniki, Serres and Komotini) in order to expand their professional skills.

6.4.9 Public Health

6.4.9.1 Overview of Health Care in Greece

The Ministry of Health and Social Solidarity (MOH) has the overall responsibility for health, including the provision of healthcare services, disease control and prevention, emergency care and crisis management. The MOH oversees the National Health System, (ESY), which was established in 1983 and provides state health care paid for by national insurance contributions, direct and indirect taxation. The system covers the entire Greek population, without any special entitlement conditions, while health care services are also provided to EU and non-EU citizens on the basis of multilateral or bilateral agreements[149]. The ESY is organized into 7 Health Authorities Regions (RHA), each one supervising health care in their area and providing emergency pre-hospital, primary and inpatient health care. Doctors working in public hospitals and health centres are full-time employees and are not allowed to engage in private practice[150]. Health care expenditure in Greece has increased from 10,589 million € in 2000, to 20,996 million € in 2007, representing 9.2% of GNP[151]. In the primary healthcare sector, there is also a significant private sector component[152], financed mainly from out-of-pocket payments and, to a lesser extent, by private health insurance.

Recently, a commission established under the Vice-President of the Government has been charged with the reduction of spending in public entities, including universities and hospitals. With this in mind, a new health fund, the National Organization for the Provision of Health Services (EOPYY), has been created with the target of gradually merging all health funds with this organization[153][154]. Visits to health posts are free but a €5 fee is paid for ambulatory (outpatient)

[149] http://old.certh.gr/libfiles/MOBILITY-PORTAL/MON-456-SAITAKIS-sec-8-health-system-in-greece-pp60-61.pdf
[150] Economou C. (2010). Greece: Health System Review. *Health Systems in Transition*, 2010, 12(7):1–180. Accessed at: http://www.euro.who.int/en/who-we-are/partners/observatory/publications/health-system-profiles-hits/full-list-ofhits/greece-hit-2010 on Dec 5, 2011
[151] Hellenic Society of Medical Oncology (EOPE). *The Forum of Clinical Oncology*, Issue 14, Dec. 2011. Available online at http://www.hesmo.gr/el/ta-nea-tis-eope/trexon-teuxos
[152] Economou, C. (2010). Op. cit.
[153] Memorandum II, p. 8, 61, 62.

care at health centres and hospitals. Emergency treatment, laboratory tests and in-patient care are all covered by health insurance and are therefore free of charge. However, according to a 2006 national survey over 65% of respondents reported spending up to €200 for medical expenses[155]. The burden on family budgets is expected to be increased, as public health expenditure must be reduced by 0.5 per cent of Gross Domestic Product (GDP)[156].

6.4.9.2 Challenges facing the Health Care system

The WHO[157] has identified a number of challenges related to the current health system including:

- A gap between declared objectives, enactment and implementation of legislation. Health care reforms have been partially or never implemented, while some others were short-lived.
- Future reforms need to focus on:
  - restructuring of primary health care;
  - pooling of financial resources;
  - changing the payment system of providers;
  - introducing new managerial and administrative methods;
  - adopting cost-effective and monitoring mechanisms; and
  - developing policies for better allocation of resources.
- Three related demographic challenges confronting Greece:
  - the ageing of the population;
  - population decline in the near future; and
  - diminishing natural population growth.

As indicated by the EuroHealthNet[158] the health care system in Greece has a gap in service provision quality between the rural and urban areas and the public health policy-making needs to keep a distinctive focus on health inequalities. In 2006, the Institute of Social and Preventive Medicine (ISPM), in collaboration with the Centre for Health Services Research of the University

[154] Akrivopoulou, C., Dimitropoulos, G. & Koutnatzis, S.I. (2012).The "Kallikratis Program". The Influence of International and European Policies on the Reforms of Greek Local Government. *Institzioni del Federalismo,* 3.2012: 653-693.
[155] Economou M, Madianos M, Theleritis C, et al, (2011). Increased Suicidality amid Economic Crisis in Greece. *Lancet*, 378(9786):124-5.
[156] Kaitelidou, D. & Kouli, E. (2012).Greece. The Health System in a Time of Crisis. *Eurohealth*, Vol. 18(1), pp. 12-14.
[157] WHO (1978). *International Conference on Primary Health Care. Declaration of Alma-Ata*.
[158] EuroHealthNet (2007). *Closing the Gap : Strategies for Action to Tackle Health Inequalities*. Available at: http://eurohealthnet.eu/sites/eurohealthnet.eu/files/publications/taking-action-on-health-equity.pdf

of Athens launched the first large scale study of health inequalities in Greece[159]. One of the findings of this review was that chronic illnesses are more frequently presented in low socio-economic groups compared with those in higher socio-economic groups (36.9% versus 30.4%) and this difference is almost doubled for certain diseases, such as diabetes. Another review of Greek studies into the relationship between socio- economic status and health[160], suggests that women are at a disadvantage in terms of poor psychological and mental health compared to men, while low socio-economic and occupational status have a detrimental effect on individual health.

Due to the economic crisis and austerity measures, health services are facing a decrease in available resources, worsening infectious disease outcomes[161] (particularly in children the elderly and prison populations) and increasing mental health issues[162]. As a result of this shortfall, the health system's compliance with the principles of the European Strategy for Health (universality, equality, social justice, social solidarity) may become problematic[163].

There is concern that the current strategies to identify cost reduction measures in the health care system are undermining the standard of care provision. Some health experts believe that only a strong primary health care system can enhance cost - effectiveness of the health services in the long run.[164165]. A systematic evaluation of public health programmes and policies is necessary in order to understand the full extent of the health system problems[166].

Further information on challenges to the healthcare system and vulnerable groups reported by key informants and focus group meetings, is presented in *Box 6-18*.

[159] Tountas, Y., Oikonomou, N., Palikarona, G., Dimitrakaki, C., Tzavara, C., Souliotis, K., Mariolis, A., Pappa, E., Kontodimopoulos, N. & Niakas, D. (2011). Socio-demographic and Socio-economic Determinants of Health Services Utilisation in Greece: the Hellas Health I study. *Health Serv Manage Res,* 24(1), 8-18.
[160] Economou, A. & Nikolaou, A. (2005). Socio-Economic Inequalities in Health : A Review of the Greek Evidence. *Spoudai*, Vol. 55, No l, (2005), University of Piraeus, pp. 74-88.
[161] Gallup World Poll 2008, www.gallup.com
[162] Suhrcke M, Stuckler D, Suk JE et al, (2011). The Impact of Economic Crises on Communicable Disease Transmission and Control: A Systematic Review of the Evidence, *PLoS ONE* 6(6): e20724. doi:10.1371/journal.pone.
[163] Adamakidou, T. & Kalokerinou, A. (2010). New HHHHealth Policies on Primary Health Care in Greece. *Health Science Journal,* V. 4(1). www.hsj.gr
[164] OECH Health Ministerial (2010). *Health System Priorities When Money is Tight* (session 1). 7−8 October 2010. Available at: http://www.oecd.org/document/0/0,3746, en_21571361_44701414_46141632_1_1_1_1,00.html (retrieved 14.2.2010)
[165] Vrachatis, D. & Papadopoulou, A. (2012). Primary Health Care in Greece: Current Data and Perspectives. *Nosileftiki*, 51 (1): 10–17.
[166] Sotiriadou K., Malliarou M., Sarafis P. (2011). **Primary Health Care in Greece** - Status and Prospects. *Interscientific Health Care* (2011) Vol 3, Issue 4, 140-148.

Box 6-18 Challenges of the Healthcare System and Vulnerable Groups

What do you think are the gaps or stresses in the health care system?

"There is a shortage of permanent doctors and doctors of varying specialties." **(Key Informant – Nea Karvali, municipality of Kavala**

"*The health system has a lot of shortages. A basic problem is lack of doctors. In the specific settlement a rural doctor comes once a week and many times he doesn't come at all.*" **(Key Informant - Thalassia,municipality of Topiros)**

Who are the most vulnerable in the community in terms of poor health?

"*The Muslim and Pomak minorities, as well as Roma. Cultural and religious issues may lead to delayed and more severe presentations of common illnesses.*" **(Key Informant, Representative of the Department of Public Health, Region of East Macedonia and Thrace)**.

"*Roma babies get sick continuously having fever, cough, mucus, ear aches. We (adults) do not have any particular health problems only we cough. This due to the fact that they live in bad conditions. We need heating. The children cry during the night because it is cold.*" **(Focus Group Roma - Mitrousi, municipality of Serres)**

"*The elderly people are most vulnerable, especially those that do not have someone to take care of them.*" **(Key Informant - Nea Karvali, municipality of Kavala)**

"Most vulnerable are those in direct contact with presticides." **(Key Informant - Kalamonas, municipality of Doxato)**

Source: Field Survey for the TAP Greece ESIA (2013)

6.4.9.3 Healthcare Facilities and Infrastructure

Health care facilities for the municipalities in the study area fall under the 3rd RHA (Central and West Macedonia) and the 4th RHA (East Macedonia and Thrace). The types of health care facilities that can be found in the study area are presented in the box below.

Box 6-19 Types of Health Care Facilities in the Project Area

• Tertiary care hospitals:	Large facilities (>200 beds) characterized as general or university hospital.
• Secondary care hospitals:	Medium sized facilities (>100 beds), usually the general regional hospitals in (e.g. Gen Hospital Kastoria, Florina, Giannitsa etc). Services usually include surgery, internal medicine and paediatrics and small ICUs.
• Health Centres:	Primary care facilities with the ability to stabilize and transport patients and perform basic diagnostic tests. Typically centres have specialised and non-specialised medical personnel (internal medicine, general medicine or paediatrics) and nurses as well as an ambulance. Health Centres are under the jurisdiction of the nearest General Hospital, from which where they receive materials, pharmaceuticals and staff as needed.
• Primary Health posts	Primary care medical offices, staffed by non-specialised medical graduates serving the rural health service before specializing. No nursing personnel or ambulance. Staff can stabilize patients and assist in transportation. They may also be required to cover the primary healthcare needs of up to 3-4 smaller communities in the neighbourhood of the primary post.

Source: Collated by ERM (2011)

In the event of a casualty incident primary health care facilities act as first responders until casualties can access more specialised care from general hospitals or tertiary care in larger centres. In terms of medical personnel per 1,000 people, the prefecture of Evros has the highest rates, followed by the area of Thessaloniki, Drama, Xanthi and Pella. Serres and Kavala Regional Entities in the Regions of Eastern Macedonia and Thrace and Central Macedonia have the lowest rates of medical personnel, as well as the lowest rates of hospital beds. In the Region of Western Macedonia Florina and Kastoria Regional Entities have the lowest rates of medical personnel whiles Imathia has the lowest rates of hospital beds. Full details on healthcare infrastructure in East Macedonia-Thrace, Central and West Macedonia can be found in *Annex 6.3*.

There are twelve General Hospitals in the broader study area located in Alexandroupoli, Komotini, Xanthi, Drama, Kavala, Serres, Naousa, Edessa, Giannitsa, Ptolemaida, Kastoria and Florina[167]. An equal number of General Hospitals are located in Thessaloniki, but outside the study area. There are two or three ambulances used by each General Hospital and at least one ambulance available at each Health Centre. The National Centre for Emergency Care covers the municipalities as follows:

[167] The General Hospitals in Edessa, Giannitsa, Veroia and Naousa will be merged under a single hospital trust and share specialists and staff. The general hospitals in Ptolemaida and Kozani will also merge under a single board and will have a shared cardiology in Kozani and a shared obstetrics/gynaecology and general paediatrics departments in Ptolemaida.

- Department of Alexandroupoli: covers Evros, Rodopi and Xanthi.
- Department of Kavala: covers Kavala, Drama and Serres;
- Department of Thessaloniki: covers Thessaloniki, Pella, Imathia; and
- Department of Kozani: covers Kozani, Kastoria and Floria

Access to health care both in terms of number of medical personnel and number of facilities varies, depending on location and distance to urban areas. According to the household survey, residents of all settlements have to travel further than 4 km to the nearest hospital. The exception to this are all the settlements in the municipality of Komotini, where almost half of the settlements are within 2 - 4 km of the nearest hospital, one settlement in Eordea and four in Skydra. The majority of settlements have a health care centre or are visited by a doctor on a weekly basis, however; 15 settlements had neither health care facilities nor visiting medical staff. All of these settlements are located in East Macedonia – Thrace (municipalities of Alexandroupoli, Nestos, Iasmos, Topiros, Avdira and Doxato). The distance to the nearest health centre varies in the municipalities. Some residence have to travel a distance of more than 20 km to the nearest health centre. These include the settlements of Peplos and Kavissos (Alexandroupoli municipality), Chamilo (Maronia-Sapes). Further details on where individuals from each settlement seek health care can be found in *Annex 6.3.0* and a map showing the location of health centres and hospitals is presented in *Annex 4.5*.

Between 67% and 100% of surveyed households in study area use public health services. A relatively high proportion of the population in Regions of Eastern Macedonia and Thrace and Central Maceodonia reported using private health services in the municipalities of Maronia – Sapes, Doxato, Alexandroupoli and Nestos (33%, 29%, 15% and 14% respectively). This is not the case in Region of Western Macedonia where the findings of the household survey indicate that use of private health care is very low with only 1% of households accessing private health care in Skydra and Kastoria.

The level of satisfaction with public health care system in Greece is reportedly low, with only 47% of people reporting they are satisfied[168] with the current system. This was reflected in the findings of focus groups were participants indicated low to average levels of satisfaction with the health care system. Complaints centred around lack of personnel at hospitals and health centres, distance to hospitals and poor transportation network that makes access to health facilities

[168] Gallup World Poll 2008 www.gallup.com

difficult, especially for elderly people who do not drive. Health care providers interviewed as key informants indicated that a number of national projects funded through the National Regional Structural Fund are underway and these may cover some of the needs in the near future.

6.4.9.4 Health Indicators

Data on health issues and diseases is available only at the old prefecture level also referred to as regional entities; as such secondary data is presented at this level.

Life expectancy in Greece is 80.1 years with women having a longer life expectancy than men, a pattern replicated in the study area according to key informants. The region of East Macedonia - Thrace is reported to have the highest mortality rate in almost all age groups and in both sexes among all Greek regions. This is explained as a combination of having one of the lowest per capita GDP with a low rate of doctors and hospital beds as compared to the national averages[169].

Crude mortality rates in the Regional Entities of the study area do not vary significantly, with the exception of Serres, where crude mortality is much higher than the country's average (13.45%). This trend is mainly attributed to the ageing of the population, resulting in a gradual slowing down of population growth over the last three decades. While infant mortality rates have been experiencing a continuous decline in Greece, rates are higher than the national average in almost all Regional Entities of the study area, with the exception of Xanthi, Pella, Kozani and Serres. High-risk pregnancies for the entire region are referred to Thessaloniki, where neonatal intensive care units are located. Finally, prior to the construction of the Egnatia highway, travel times to Florina could be up to 6 hours affecting access to care for infants and mothers in distress. The most common causes of infant mortality, especially in rural areas, is due to infectious diseases, injuries incurred at birth, post-natal asphyxia and diseases specific to early infancy and immaturity[170][171].

Data from the household survey indicates that the number of respondents reporting that a member of the household had passed away in the past year was higher in the municipalities of

[169] Hadjichristodoulou, C., Papastergiou, P., Rachiotis, G., Polyzou, K. & Zilidis, C. (2008). Regional Differences in Mortality in Greece (1984-2004). The Case of Thrace. BMC Public Health, 8:297.
[170] Yfantopoulos, N. (1999) Demographic Trends and Socio-Economic Indicators in EU and Greece. In A.J. Metaxas (Ed.), About Greece. Ministry of Press and Mass Media, pp. 149-159.
[171] Hellenic Statistical Authority, Report 2008, accessible at: www.statistics.gr

Iraklia, Nea Zichni, and Serres (all of them in the Perfecture of Serres) in TAP Greece East and Amyntaio and Naousa in TAP Greece West. In 29% of the surveyed households in Iraklia, a member of the household had passed away in the past year. This might be considered as a further indication that the prefecture of Serres may be the most vulnerable in terms of general health and population ageing. The available data concerning key health indicators for Greece and for the prefectures in the socio-economic study area are presented in *Table 6-124*.

Table 6-124 Key Health Indicators

Indicator	*Life Expectancy*	*Life Expectancy Men*	*Life Expectancy Women*	*Crude Mortality Rate (per 1,000)**	*Maternal Mortality rates/ 100,000 live births*	*Infant Mortality Rates/ 1,000 live births*	*Under 5 Mortality Rates/ 1,000 live births*
Greece	80.1	77.8	82.5	9.6	1.79	2.7	3.4
Evros	-	-	-	11.8	-	17.81	-
Rodopi	-	-	-	10.4	-	5.34	-
Xanthi	-	-	-	8.37	-	0.7	-
Kavala	-	-	-	11.75	-	4.62	-
Drama	-	-	-	11.77	-	7.43	-
Serres	-	-	-	13.45	-	1.61	-
Thessa-loniki	-	-	-	7.03	-	9.5	-
Imathia	-	-	-	9.3	-	7.22	-
Pella	-	-	-	11.07	-	0.75	-
Kozani	-	-	-	10.19	-	1.38	-
Florina	-	-	-	10.12	-	8.2	-
Kastoria	-	-	-	9.69	-	4.19	-

Source: Hellenic Statistical Authority 2008/ WHO Greece Health Profile, accessed on 31-01-2013.

6.4.9.5 Mortality and Morbidity

Table 6-124 outlines in more detail the top causes of death by gender from data in 2006. Reflecting the data from key informant interviews the leading causes of death are associated with cardiovascular diseases, followed by cancer. As indicated in *Table 6-125* , diseases usually associated with diet and life-style factors (e.g., lack of exercise, smoking, high fat diets, stress) appear to be prevalent in all Regional Entities of the study area. Mortality from communicable diseases, as indicated by mortality rates due to infectious diseases, has declined, with the

exception of the prefecture of Pella, Drama, Evros and Kozani. The perfectures of Evros, Rodopi,Serres and Imathia have the highest mortality rates due to traffic accidents.

Table 6-125 Leading causes of death, 2006

Indicator		*Ischaemic cardiopathy mortality (per 1,000 persons)*	*Cerebrovascular incidents mortality (per 1,000 persons)*	*Breast Cancer Mortality (per 1,000 persons)*	*Lung Cancer Mortality (per 1,000 persons)*	*Traffic Accident Mortality (per 1,000 persons)*	*Infectious Diseases Mortality (per 1,000 persons)*	*SMR general mortality**
Greece	**M**	108.9 - 189.6	66.6 - 234.6	n/a	64.5 - 216.6	18.8 - 87	0 - 37.18	77.98 - 123.92
	W	39 - 179.5	97.8 - 328.39	17.6 - 69.6	5.07 – 47.5	7.4 - 47.5	0 - 35.6	
Evros	**M**	173.06	191.01	n/a	123	83.33	6.41	106.34
	W	109.74	282.78	63.31	15.48	22.51	1.41	
Rodopi	**M**	202.21	176.47	n/a	128.68	82.72	2.14	117.4
	W	156.42	214.42	40.42	12.3	17.58	5.27	
Xanthi	**M**	164.38	115.25	n/a	81.24	47.23	5.67	123.92
	W	79.33	143.55	22.67	11.33	13.22	3.78	
Kavala	**M**	164.07	175.69	n/a	135.03	58.63	4.36	116.05
	W	103.47	223.71	54.53	15.38	15.38	4.36	
Drama	**M**	159.86	176.05	n/a	194.26	66.78	8.09	112.48
	W	105.3	247.65	46.8	21.45	9.75	3.9	
Serres	**M**	227.91	226.84	n/a	182.97	70.62	2.14	115.89
	W	165.4	286.08	49.93	20.81	21.85	3.12	
Thessaloniki	**M**	126.34	98.95	n/a	78.14	42.9	3.65	98.06
	W	68.84	124.98	39.31	14.94	11.85	3.26	
Imathia	**M**	155.9	154	n/a	106.7	70.2	4.21	109.16
	W	114.0	191	27.4	11	8.2	4.12	
Pella	**M**	193	209	n/a	154	68.9	9.64	105.51
	W	99.2	296	48.2	22	11	11	
Kozani	**M**	167	167	n/a	119	54.4	6.48	101.6
	W	98.4	199	41.4	22	27.1	1.3	
Florina	**M**	160	105	n/a	113	36.3	0	102.58
	W	112	119	33.6	37.3	7.4	7.47	
Kastoria	**M**	127.1	156	n/a	98	50.8	14.5	98.37
	W	53.3	217	64	15.2	11.4	0	

Figures for Greece presented as a range reflecting the highest and lowest rates at a prefectural level. Sources: National Health Map (Greece), accessed at: http://www.ygeianet.gov.gr / [31-01-2013] / Hellenic Statistical Authority / WHO, Greece: Health Profile.

Leading causes of ill health coincides with the leading causes of mortality as shown in *Table 6-126*, with diseases of the cardiovascular system recorded as the leading cause for hospitalisation

followed by neoplasms and accidents. Screening uptake varies considerably along the route, with Kastoria and Rodopi reporting the lowest rates of preventive screening tests.

Table 6-126 Leading hospital discharge diagnoses, 2006.

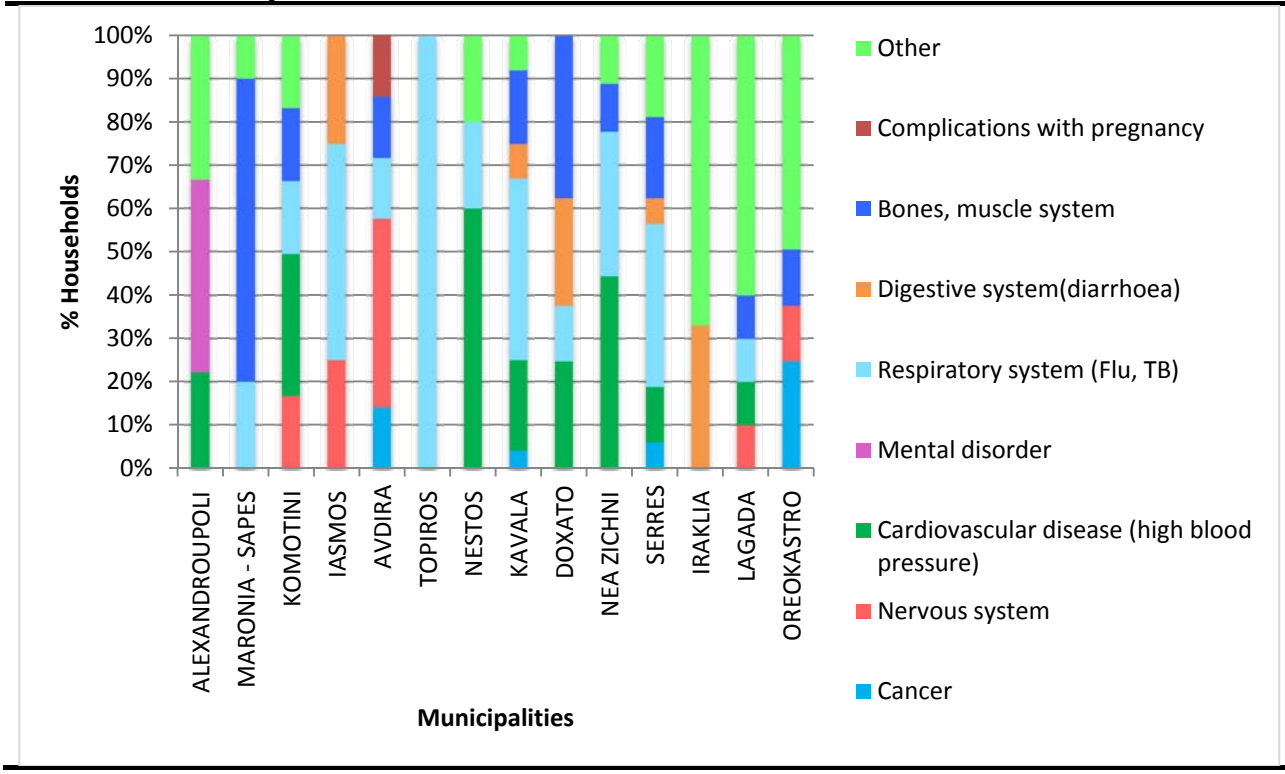
Indicator	*Visits per person per year to a health facility*	*All diagnoses (per 1,000 persons)*	*Diseases of the cardiovascular system (per 1,000 persons)*	*Diseases of the respiratory system (per 1,000 persons)*	*Neoplasms (per 1,000 persons)*	*Diseases of the musculoskeletal system & connective tissue(per 1,000 persons)*	*Accidents and Poisonings (per 1,000 persons)*	*Infectious and Parasitic Diseases (per 1,000 persons)*	*Screening tests for prevention (per 1,000 persons)*
Greece	7.9 – 9.53	119.7-275.5	14 – 47.23	7.46 – 29.97	11.77-29.79	3.82 – 16.44	9.3 – 26.44	1.57 – 8.73	33.32 – 281.25
Evros	10.87	213.71	36.18	16.77	20.71	8.14	17.61	5.26	156.25
Rodopi	9.68	181.04	27.95	15.59	15.98	7.54	18.35	6.25	70.18
Xanthi	7.45	218.43	33.75	13.82	19.52	11.06	19.51	6.94	84.75
Kavala	5.65	227.45	30.47	17.95	26.32	13.93	19.23	7.46	141.18
Drama	8.9	195.84	33.99	14.04	22.05	10.47	15.63	4.1	155.17
Serres	8.09	174.64	28.75	11.06	21.28	7.09	15.54	3.65	98.48
Thessaloniki	8.03	185.8	28.7	12.3	19.53	8.91	15.09	4.97	127.8
Imathia	10.32	198	29.6	13.9	20.8	11.66	16.6	5.08	140
Pella	5.6	192.3	29.6	14.9	19.5	8.75	17.08	6.39	133.3
Kozani	11.87	203.9	31.4	14.7	20.63	14.58	20.52	7.83	163
Florina	13.5	220.5	36.03	13.9	22.1	16.44	21.74	5.4	281.2
Kastoria	8.52	185.8	35.08	8.8	21.33	12.69	16.41	5.25	64.52

Figures for Greece presented as a range reflecting the highest and lowest rates at a prefectural level
Sources: National Health Map (Greece), accessed at: http://www.ygeianet.gov.gr/ [31-01-2013] / Hellenic Statistical Authority /WHO, Greece: Health Profile.

The information above is supported by the household survey results, focus groups and key informant interviews, with participants reporting cardiovascular diseases, respiratory diseases, muscular problems, diabetes and cancer among the most common reasons for visiting the doctor in the previous three months (see figures below). In children, asthma and obesity were raised as the leading cause of ill health. Obesity in the paediatric population in Greece has been recognised as a major trend and problem, and actions to combat it have been prioritised in the health programme of the MoH[172].

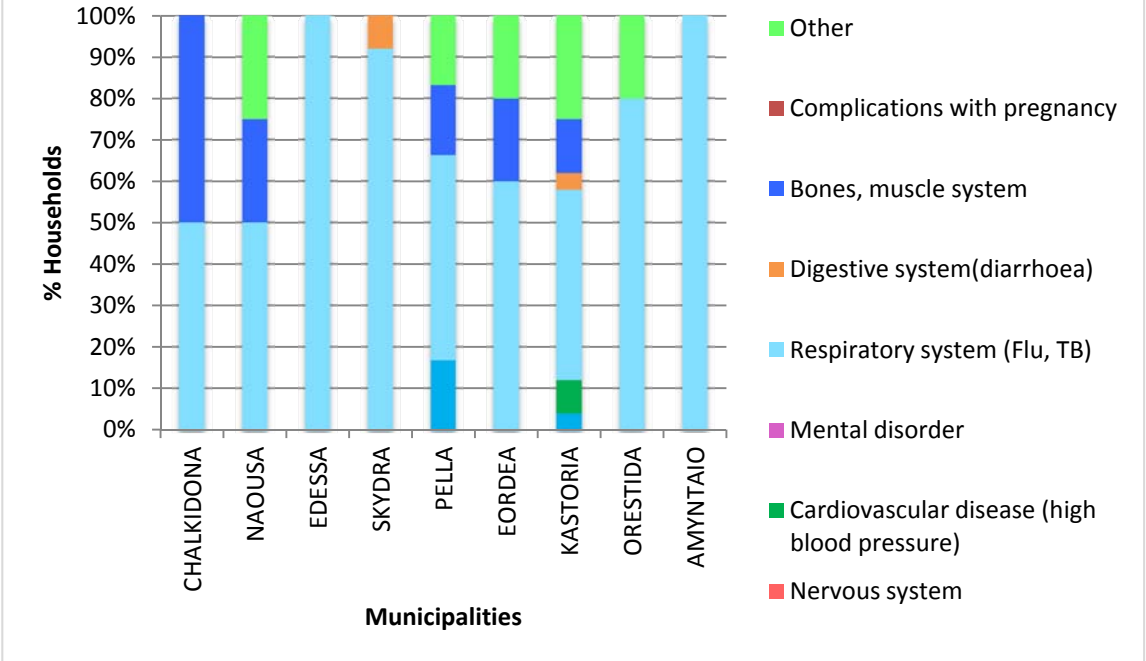
172 T Tzotzas T, Kapantais E, Tziomalos K et al. Prevalence of overweight and abdominal obesity in Greek children 6-12 years old: Results from the National Epidemiological Survey Hippokratia, 2011;15(1):48-53, Accessed at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3093145/?tool=pubmed

Figure 6-134 Ailments Suffered in the Last 3 Months in Households within the Socioeconomic Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

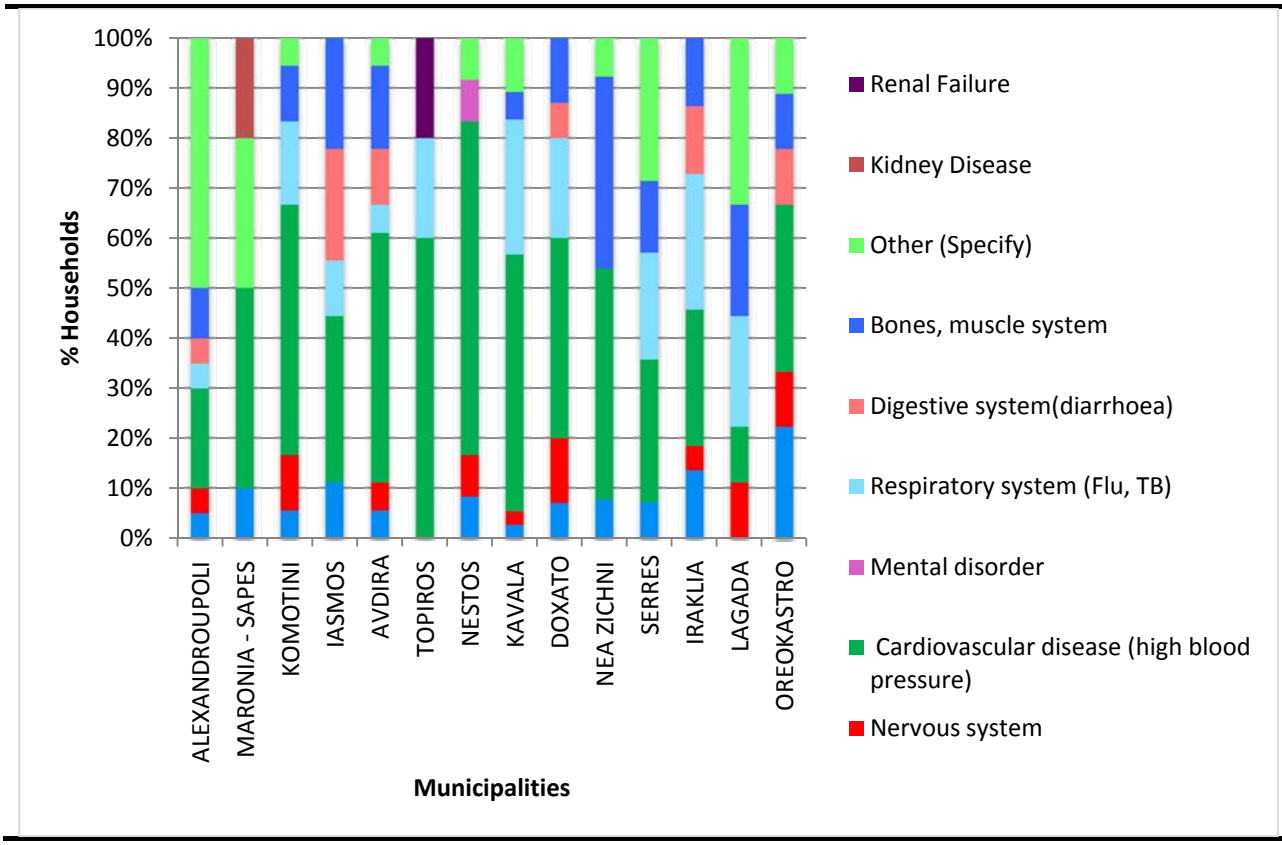
Figure 6-135 Ailments Suffered in the Last 3 Months in Households within the Socioeconomic Study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

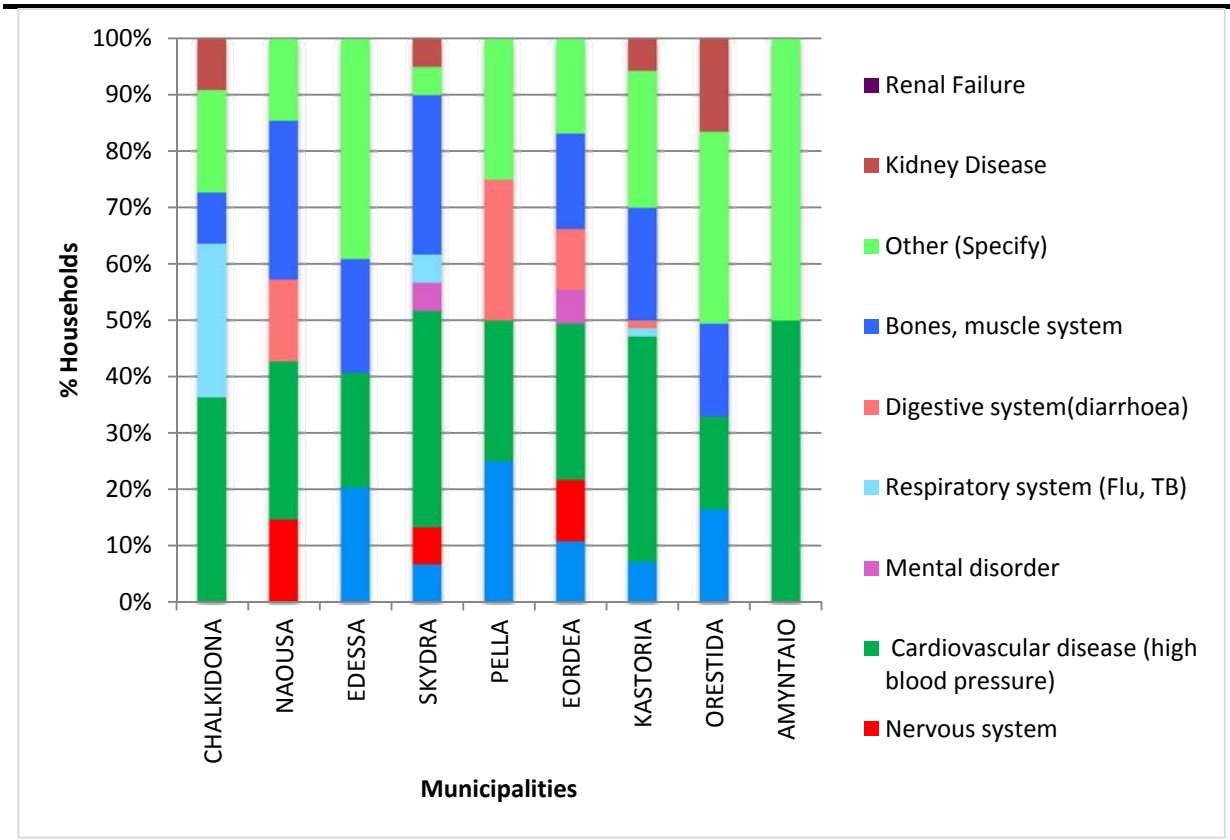
The number of households reporting incidences of chronic illness is high throughout the study area. Between 20% and 80% of surveyed households reported having one member with a chronic condition, with the most vulnerable municipality reported as Maronia-Sapes (80% of surveyed households had a chronically ill member). The main causes of chronic illness reported in the study area are presented in the figures below.

Figure 6-136 Main Causes of Chronic Illness in the Socioeconomic Study Area in TAP Greece East



Source: Household Survey for the TAP Greece ESIA (2013)

Figure 6-137 Main Causes of Chronic Illness in the Socioeconomic Study Area in TAP Greece West



Source: Household Survey for the TAP Greece ESIA (2011)

Cancer rates in Macedonia and Thrace are generally higher than the national average[173]; which is related to high concentrations of uranium and other heavy metals in the rock formations of Xanthi and Kavala[174], as well as intensive use of fertilizers that adversely influence the quality of water[175]. This was supported during the field visit as high rates of cancer were reported by participants in focus groups throughout the study area and in Feloni (municipality of Avdira) it was reported that there has recently been a large increase in thyroid cancer, with 80% of cases being women, although the reasons for this are unknown. The highest proportion of households reporting that one of the household members has cancer were recorded in the municipality of Pella (25%), Orestida (15%), Naousa (13%), Maronia – Sapes (10%) and Oreokastro (10%).

[173] Eurostat, Public Health Database, Last renewed 15-02-2013
http://epp.eurostat.ec.europa.eu/portal/page/portal/health/public_health/data_public_health/database
[174] See: Institute of Geology and Mineral Exportation (IGME)
http://portal.igme.gr/pls/portal/docs/PAGE/IGME_PORTAL/IGME_HOME_PAGE_EXT/EGS2010.PDF
[175] Petalas, C., Lambrakis, N. & Zaggana, E. (2006). Hydrochemistry of Waters of Volcanic Rocks. The Case of the Volcanosedimantary Rocks of Thrace, Greece. Water, Air and Soil Pollution, 169, pp. 375–394.

In Mitrousi (municipality of Serres), respiratory problems were reported by a health professional key informant as a major health problem, attributed to the humidity of the area (rice plantations). Allergic conditions and respiratory problems attributed to humidity were also reported in Polystylo (municipality of Kavala), Kalamonas and Agia Paraskevi (municipality of Doxato). Exposure to damp is a strong and consistent indicator of risk for a number of respiratory illnesses, including asthma and respiratory symptoms such as cough and wheeze[176]. Also, in the nearby settlement of Probatas (municipality of Serres), key informants reported high rates of respiratory problems and cancers, relating to the chemicals released into the atmosphere during the processing of the rice in the settlement,. According to key informants, a high number of the people working in the rice industry have respiratory problems or cancer.

6.4.9.6 Non-Communicable Diseases

The leading causes of ill health from non-communicable diseases in Greece includes hypercholesterolemia, diabetes, and hypertension. Other common diseases include neuropsychiatric disorders, diseases of the digestive system, chronic respiratory diseases, and cardiovascular diseases. Cancer is also increasing in incidence in the population (see *Section 6.4.9.5* above) and the most common forms of cancers are of neoplasms of the breast, lung, liver and haemopoetic system. Greece has also a high incidence of thalassemias, an inherited autosomal recessive blood disease causing anaemia and requiring blood transfusions[177].

Lifestyle-associated health issues are of growing importance. Smoking, substance abuse, lack of exercise and over-consumption of fatty and salty food contribute to a significant proportion of overall morbidity and mortality. Key health informants mentioned increasing smoking and alcohol consumption in East Macedonia-Thrace as a means to socialize and release the pressure of everyday life while in West Macedonia increase in smoking and alcohol consumption is mostly related to the very high unemployement rares in the area (up to 22% crude unemployment, which is much higher (up to 35%) for women and younger persons).

[176] WHO Regional Office for Europe (2009). Children Living in Homes with Problems of Damp. Copenhagen (ENHIS Fact Sheet 3.5).
[177] PanHellenic Association of patients with Thalassemia. Accessed at www.pasapama.gr

6.4.9.7 Communicable Diseases

Communicable diseases morbidity and mortality in Greece is low, as shown in *Table 6-125* and *Table 6-126.*

Tuberculosis (TB) remains the most commonly reported communicable disease and has been identified as a public health challenge for 2012, due to increasing number of confirmed cases of TB (approx. 600 annually) especially in immigrants[178]. In northern Greece, no hospital is properly equipped for the detection of TB mycobacteria and samples are sent to Athens, resulting to a 10-day delay in diagnosis and treatment.

Vaccine preventable diseases (e.g. tetanus, diphtheria, pertussis, measles etc) have very low incidence in Greece due to the high levels of vaccination coverage. Between 2004 and 2011, the geographical area of East Macedonia-Thrace had the highest mean annual notification rate of hepatitis A (4.2 cases per 100,000 population)[179]. Hepatitis A continues to be a public health concern, especially in Roma population. Children belonging to minority groups have lower vaccination coverage than the general population[180]. Therefore it is necessary to monitor the vaccination coverage of the population and implement measures in order to improve it.

6.4.9.8 Sexually Transmitted Infections

The prevalence of HIV/AIDS per 1,000 adults (15-49 years) is lower than the European region average of four[181]. In Greece HIV infection is largely an urban problem with intravenous drub users and men having sex with men accounting for the majority of the new infections[182][183]. Greece has also seen an increased in the rate of syphilis[184]. Interviewed health professionals reported sexually transmitted infections to be rare in the study area.

[178] Epidemiological data on TB in Greece, 2004-2010. Hellenic Centre for Disease Control and Prevention. Accessed at: http://www.keelpno.gr/Portals/0/Αρχεία/Αναπνευστικού/Φυματίωση/Φυματίωση 2004-2010.pdf
[179] Epidemiological data on Hepatetis A in Greece, 2004-2011. Hellenic Centre for Disease Control and Prevention. Accessed at: http://www.keelpno.gr/Portals/0/Files/English%20files/Reports%20(annual-periodical)/Waterborne-foodborne%202012/Hepatitis%20%CE%91_2004-2011_annual.pdf
[180] WHO, Greece: Health Profile. Accessed at http://www.who.int/countries/grc/en on Dec 5, 2011
[181] WHO Countries Greece: http://www.who.int/gho/countries/grc.pdf
[182] European Centre for Disease Prevention and Control (ECDC) (2012). Technical Report. Risk Assessment on HIV in Greece. Stockholm, 2012. Accessed at: www.ecdc.europa.eu
[183] Epidemiological Data on HIV infection in Greece, October 2011. Hellenic Centre for Disease Control and Prevention. Accessed at: http://www.keelpno.gr/Portals/0/Αρχεία/Επιδημιολογικάδεδομένα/ΕΠΙ_ΗΜΙΟΛΟΓΙΚΑΗΙV2011.pdf
[184] Hellenic Centre for Disease Control and Prevention- HIV/AIDS and Other Sexually Transmitted Diseases. Newsletter, 15 Au. 2012.

6.4.9.9 Vector Borne Diseases

In 2011 Greece recorded its first outbreak of malaria since 1974 in southern Greece connected to migrant farm workers from malaria endemic areas of the Indian subcontinent[185]. The vector for the transmission of malaria *Anopheles* mosquito is present in the Project area, but regular vector control activities take place annually.

Cases of West Nile virus (WNV) encephalitis were reported in 2010 and 2011. The epicentre of the outbreak was Imathia and Pella prefectures in Central Macedonia. Cases were mostly elderly men living in rural areas, in the neighbourhood of open water collection systems; a seroepidemiological survey in November 2010 estimated an infection rate in the general population of around 5%[186][187]. From the beginning of 2012 and up to October of the same year, 75 laboratory confirmed cases were reported overall in Greece, 59 of which have been classified as imported[188].

Table 6-127 Reported Number of Cases of WNV (2010-2011)

WNV cases with neurological symptoms	*Summer 2010*	*Summer 2011*	*Summer 2012*
Greece number of cases (incidents per 100,000 inhabitants)	197 (7.2)	75 (0.7)	109 (1)
Evros	-	-	-
Rodopi	-	-	-
Xanthi	-	-	23(20.67)
Kavala	1 (0.7)	-	18 (14.4)
Drama	-	-	5(5.08)
Serres	21 (11.5)	5 (2.8)	-
Thessaloniki	60 (5.3)	6 (0.5)	7 (0.6)
Imathia	39 (27.06)	3 (2.08)	3 (2.32)
Pella	41 (28.2)	5 (3.45)	2 (3.17)
Kozani	1 (0.65)	1 (0.65)	0
Florina	0	0	0
Kastoria	0	0	0

Source: Annual Epidemiological Surveillance Reports on WNV infections accessed at: www.keelpno.gr

[185] Danis K, Baka A, Lenglet A, et al. Autochthonous Plasmodium vivax malaria in Greece, 2011. Euro Surveill. 2011;16(42):pii=19993. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19993
[186] Papa A, Danis K, Baka A, et al Ongoing outbreak of West Nile virus infections in humans in Greece, July – August 2010. Euro Surveill. 2010;15(34):pii=19644. Available online: http://www.eurosurveillance.org
[187] Danis K, Papa A, Papanikolaou E et al Ongoing outbreak of West Nile virus infection in humans, Greece, July to August 2011. Euro Surveill. 2011;16(34):pii=19951. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19951
[188] Hellenic Centre for Disease Control and Prevention. Epidemiological Surveillance Report –Malaria, Oct. 2012.

As it is shown in the table, the rural areas of East Macedonia were within the focus area of the 2012 epidemic. More detailed data indicate that most cases were reported in the municipality of Avdira (11), Topiros (10), Nestos (10) and Kavala (8). In the prefecture of Thessaloniki, 3 of the reported cases were recorded in the municipality of Chalkidona and 1 in Oreokastro.

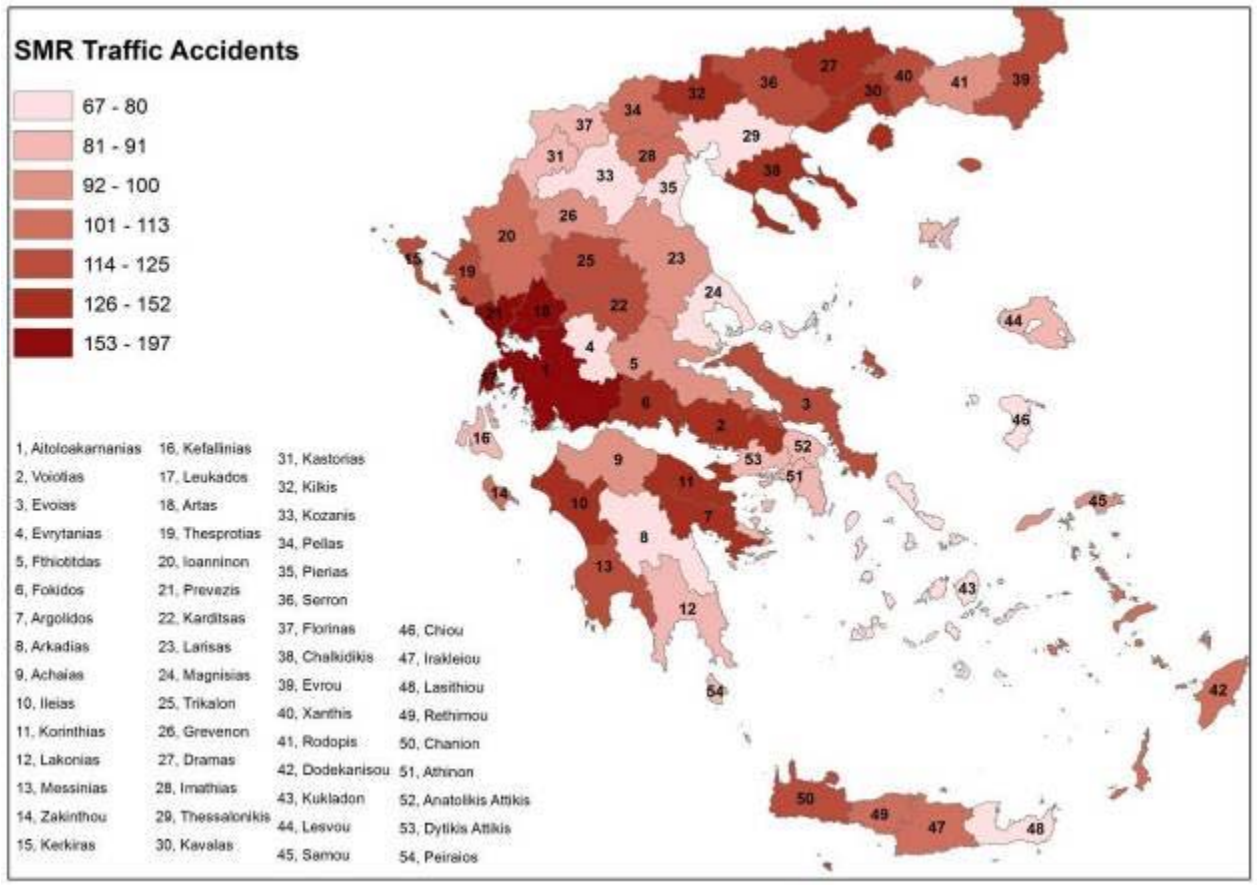
6.4.9.10 Accidents and Injuries

Road traffic accidents are the third most common cause of death in Greece with children, adolescents and young adults being particularly vulnerable. A total of 1,381 deaths were recorded in 2010 and 1,754 severe trauma cases in Greece due to traffic accidents[189].Only the Regional Entities of Kavala and Evros presented a high number of deaths due to traffic accidents, although interviews with health care professionals indicated that currently, with Egnatia Highway being fully functional, there are decreased rates of traffic accidents due to increased safety measures. The area of Central and West Macedonia does not have high numbers of deaths due to traffic accidents although interviews with health care professionals indicated that injury from accidents are a problem In Mitrousi, municipality of Serres (Central Macedonia), it was reported by an interviewed health worker that traffic accidents are common in the area, “especially by young people who are frivolous, they stay out late at night and they drink”.

The figure below shows the standardised mortality rate associated with traffic accidents in Greece.

[189] ETSC, 2010 Road Safety Target Outcome: 100,000 fewer deaths since 2001, 5th Road Safety PIN Report, June 2011. Accessed at: http://www.etsc.eu/documents/pin/report.pdf

Figure 6-138 Standardized Mortality Ratio for Traffic Accidents, Greece, 2011



Source: Operational Plan for the Restructuring of Greek Hospitals, Ministry of Health and Social Solidarity, Accessed at: http://platon.cc.uoa.gr/~reconweb/new2/

6.4.9.11 Key Health Challenges in the Study Area

According to the above findings, the issues representing the key challenges in relation to health in Central and West Macedonia and East Macedonia - Thrace are:

- population ageing, which may increase pressure for more health provisions including nursing care, due to the increase in long-term chronic degenerative diseases;
- high rates of cancer, which implies augmented needs of specialized health provisions and continuous research on the possible causes of the high cancer incidence in the area (especially East Macedonia – Thrace);
- high rates of smoking and alcohol consumption (especially in the male population and regardless of age);

- low vaccination coverage of minority groups;
- rising TB rates;
- emerged vector borne diseases that need appropriate risk assessment, monitoring and coordination for vector prevention actions;
- decreasing resources of the national health system, due to large financial cuts and restructuring of the national resources. The impact of this is more severe for small, remote rural settlements of the study area, mainly inhabited by elderly population;
- regional disparities in resource allocation, with inefficient allocation of human and economic resources in some municipalities (limited availability of services) and underdevelopment of local needs assessment and priority-setting mechanisms.

These challenges mirror the issues raised by the WHO at the national level as discussed in *Section 6.4.9.2.*

6.4.10 Safety and Security

6.4.10.1 Public Safety / Crime Indicators

In both Central Macedonia and East Macedonia – Thrace, crime indicators as recorded by the police went up between 2010 and 2011[190], with major increases recorded in crimes related to fraud (approximately 100% in Central Macedonia and 42% in East Macedonia Thrace), theft (40% and 24% respectively), smuggling (464% and 62.5%) and drugs (11.9% and 20%). In West Macedonia all crime was down between 2010 and 2011, with the exception of fraud (approximately 200%), illicit trade of antiquities (up 50%), drugs (up 9.7%), guns (up 18%) and burglary (up 17%). Animal theft has increased only in Central Macedonia (up 47%), while an increase in robberies was recorded only in East Macedonia – Thrace (up 31.4%). The increasing trend in crime indicators in Central Macedonia and East Macedonia-Thrace is a key challenge for policy makers. Overall crime is significantly lower in West Macedonia. Women focus groups[191] mentioned safety among the main assets of their life quality stating that, up to present, they feel secure regarding their children safety and that children can play in the streets without an adult

[190] Hellenic Police, Ministry of Public Order and Citizen Protection, Statistical Data released on 11-03-2012.
[191] Focus group Women, Peplos (Alexandroupoli municipality), Monoklisia (Serres municipality) and Amygdaleonas (Kavala municipality).

supervising them. Only in isolated cases focus groups participants reported an increase in robberies in the settlement during the last few years.[192]

6.4.11 Vulnerability

Vulnerability to socioeconomic impacts is understood as the ability of receptors to adapt to socioeconomic or bio-physical change[193]. Vulnerable individuals and groups are potentially more susceptible to negative impacts or have a limited ability to take advantage of positive impacts. Vulnerability is a pre-existing status that is independent of the Project and may be reflected by an existing low level of access to key socioeconomic or environmental resources or a low status in certain socioeconomic indicators.

This section identifies individuals and groups in the study area that are differentially more vulnerable than the general population, whether this is due to a specific characteristic, or as a result of a broader range of factors. The understanding of vulnerabilities provided here is drawn on in the Assessment of Impacts in order to evaluate whether impacts are more significant for specific population groups and, where necessary, to develop additional targeted mitigation measures.

Within every vulnerability assessment there are some population groups that are automatically considered due to their positioning within society and/or inherent characteristics that make them more susceptible to change. In addition, there may be other groups that are vulnerable due to the specific socioeconomic context. The main population groups that have been identified as potentially vulnerable in the context of the TAP Project in Greece and the rationale for their identification are presented in *Box 6-20.*

[192] Focus group Farmers, Amaxades (Iasmos municipality).
[193] Blackwood, D. L. & Lynch, R. G. (1994). The Measurement of Inequality and Poverty: A Policy Maker's Guide to the Literature. World Development 22(4), 567-578.[193] Minimum wage in Greece is €586 a month; however, as this wage is not enough to cover basic needs, households earning less than €900 a month are classified here as low income.

Box 6-20 Generic Vulnerability

Generic Vulnerability

- **Women**: Due to the nature of domestic relations women may be reliant on the male members of the family for financial support; as such they are less likely to have access to financial assets. In addition, in many settlements women may be unable to partake in communal decision-making and are reliant on male members of the household to share information with them. Within this group, **female-headed households** may be specifically vulnerable as they may be less likely to have any form of representation at a settlement level.
- **Minority groups**: Some groups may be marginalised with reduced access to healthcare, education, freedom of speech, credit and other services. In most cases minority groups have their own religion or language, which are not the ones practiced by the dominant group.
- **Children**: In order to access assets/resources children are often reliant on older members of the household or community. When a child is not adequately represented by an adult they may be vulnerable to exploitation within the community or work place.
- **Youth**: Youth may be vulnerable in terms of access to assets, education or employment opportunities.
- **Elderly/retired**: Retired members of the community may have a minimal income and are more likely to have reduced physical or mental capacity to cope with changes to their environment.
- **Households on low income**[194]: Low-income households have fewer resources to rely on and are less likely to have savings and/or access to credit, which make them vulnerable to shocks and change.
- **Physical /mental health and disability**: Those who lack physical mobility or who have mental health issues may be vulnerable to changes and unable to participate in decision-making. This also includes addicts such as those reliant on drugs or alcohol.

Source: Socioeconomic Study for the TAP Greece ESIA (2011)

A vulnerability framework was used as the basis of the assessment of vulnerability within the context of the socioeconomic study area. The vulnerability framework, which draws from policies and methodologies used by development and rights based organisations, is based on a set of indicators encompassing access to livelihoods resources and socioeconomic status. Where relevant and possible, the locations along the study corridor where vulnerable individuals or groups are likely to reside or work are also indicated. This analysis is presented in a matrix in *Annex 6.3.0*, while the groups identified through the analysis are discussed below.

In summary, the vulnerable groups identified through the development of this socioeconomic baseline are as follows:

- ***Women*:** A large number of women in the study area are not employed, which means they do not have direct access to income. This makes women vulnerable to changes to the

[194] Minimum wage in Greece is €586 a month; however, as this wage is not enough to cover basic needs, households earning less than €900 a month are classified here as low income.

households' employment and income status without having the ability to address or act upon this change. Furthermore, as indicated by the field survey, female participation in decision - making systems at the communal level remains low.

- ***Youth*:** Youth are considered potentially vulnerable particularly in municipalities where there is high youth unemployment. They will typically have less access to resources including income and savings. Young people who are out of work may be more likely to accept substandard working practices in order to gain employment opportunities. Also, in small rural settlements of the study area, most young people are forced to either migrate, or enter workforce at a very young age and with few educational qualifications, which might contribute significantly to the inter-generational transmission of poverty.

- ***Households with low income*:** Low-income households, which includes the unemployed, are vulnerable as they have fewer resources to cope with change and they are less likely to have savings and access to credit. Within the low-income group, there exist individuals that are additionally vulnerable, including children, youth and the elderly. Low-income households can be found throughout the study area, but are prevalent in municipalities in the eastern part of the study area, i.e, Topiros, Alexandroupoli, Maronia – Sapes, Komotini and Kavala. In four municipalities of the study area (Kavala,Topiros, Nestos and Iraklia), more than 15% of the population were unemployed, whilst in some settlements in the municipality of Alexandroupoli (Agnantia and Pamforo) there are many orphans and single parent families with serious survival problems. Also, unemployment and lack of principal livelihoods is prevalent in the settlement of Neos Zygos (municipality of Kavala) inhabited by Georgian immigrants. Results of the socioencomic field survey indicate that the quality and access to food has significantly deteriorated in the last year, which will suggest that the number of low-income households is increasing.

- ***Farmers who have been adversely affected by previous infrastructure projects:*** As the pipeline runs for its most part parallel to the existing DESFA pipeline, a proportion of the population in the study area has been negatively affected by the old pipeline construction. Many farmers have experienced negative impacts that have affected their livelihoods and resources, their lands have been removed or fragmented without being adequately reinstated. In addition, they have received small compensations, compensation has taken a long time to be received or it has not been received at all.. This results to heightened vulnerability to any possible impacts of the proposed project on their livelihoods.

- ***Seasonal migrants:*** Seasonal migrants in the study area are particularly vulnerable as they are underrepresented in decision - making in the community and they are more likely to have unsecured tenure. Hence they will be highly vulnerable to any disruptions to agriculture in the study area. It is also anticipated that seasonal migrant workers may have lower income levels than the average for the study area.

- ***Roma:*** Roma have multiple characteristics that make them vulnerable. They exist to a large extent outside of the formal administrative and support networks provided by the Greek state. They typically have less formal education, less access to health services and are less competitive in the job market, have lower incomes and can be subject to discrimination.

Summary of Vulnerable Groups

Vulnerability is a key element of any impact assessment as the information presented in this section will, to a certain degree, determine the mitigation measures implemented prior to and during Project construction and operation. In some instances measures to mitigate impacts to vulnerable groups are no different from those implemented for the whole population. However, it is important to highlight and consider each incidence of vulnerability to ensure that no individual is adversely affected by the Project over an above the general population.

The vulnerable groups highlighted in *Section 6.4.11* above will be discussed in relation to each Project impact, where applicable, in throughout *Section 8*. Where groups and individuals are not considered vulnerable they have been excluded from the summary box or text presented under each issue. Women have been considered throughout this process and the EBRD Gender Matrix has been used as an additional tool to ensure that this group is adequately represented in this study.

6.5 Cultural Heritage

6.5.1 Introduction

This section addresses Cultural Heritage Baseline Conditions of the TAP Project in Greece.

The types of Cultural Heritage considered in the ESIA Baseline include

- **Archaeological sites** which are defined as areas of ancient or historic human activity, or occupation, often including subsurface resources and which can at times be identified by the presence of surface artefacts or structural remains. These include ancient cist or tumulus graves, ancient settlements, and ceramic scatters, among others;
- **Monuments** which are defined as above ground structures of public interest and /or historical significance. These include historic churches, bridges, war memorials, and World War I and World War II era military facilities;
- **Sites with Intangible Cultural Heritage (ICH) value** which are defined as sites that reflect the spiritual or cultural lives of modern populations such as roadside shrines and places of worship together with customs, traditions and beliefs that make a people or a region distinctive and socially cohesive. ICH is protected by Greek National Legislation and International Standards.

In several occasions, CH sites were verified by more than one informational source at the same time, e. g. Ministry of Culture, Literature Review, Ephorates' official answers (competent EPCA/ EBA), Large Projects Department, Field Surveys. In the following tables, only one of the various sources is referenced. Additional information is provided at *Annex 6.1 - Baseline Bibliography* and *Annex 6.4.0 – Supporting Materials Cultural Heritage Baseline*. Cultural heritage sites that are included in the official 'Catalogues of Archaeological Sites and Monuments' of the Ministry of Culture, do not have numerical feature ids. Therefore, the numbers of the CH sites presented in the following tables are conventional; these numbers aim to facilitate the illustration and identification of the involved cultural heritage sites/ areas. A small number of cultural heritage sites was not sufficiently recorded or documented, at this stage of research due to modifications of the basecase or limited official sources.

6.5.2 Information Sources and Methods

6.5.2.1 Overview of Baseline Studies

The Cultural Heritage study area was defined by a combination of the 2 km wide corridor centred on the base case route and a 50 m buffer area around Project Components. These project components include compressor stations, block valves and logistic features, such as access roads, pipe yards and construction camps. This study area was chosen as a relevant unit for identifying the main Cultural Heritage sites involved in the project and addressing potential Cultural Heritage impacts.

Cultural Heritage sites located outside of the base case corridor were also reviewed during the desktop study and visited during the fieldwork, in some cases, in order to verify that their limits were indeed out of the 2km corridor, by investigating their visible boundaries.

The Cultural Heritage Baseline was compiled from the following sources

- Desktop Study (Literature Research) and use of satellite images
- Consultation with experts and informed individuals, including representatives of the competent Authorities and official correspondence with them
- Field reconnaissance along the base case project route, by field surveys in selected sites/areas within the 2km corridor. These field surveys were performed in cooperation with the competent Authorities.

Desktop study for the ESIA drew on substantial information from earlier published literature. Regarding the West Section (KP 359 – 543), field surveys were conducted for the ESIA in October 2011, whilst for the East Section (KP 0 – 359) in November 2012 and February 2013. All site visites were supported by field maps that used high resolution satellite images in the background to provide for location identification and understanding of the spatial context. In one instance (Korissos, see *Section 6.5.3.2.10*) the satellite data were used to undertake an aerial analysis of markings on the landscape, which suggested a major cultural heritage constraint. Data obtained through both the desk and field studies in the corridor were used to characterize baseline conditions.

Data obtained through both the desktop study and then field survey activities in the 2km corridor were correlated with the received official replies from the competent Authorities in order to characterize baseline conditions.

6.5.2.2 Desk Review

The overall objective of the desktop study was to identify known Cultural Heritage sites. Areas of High Archaeological Potential (AHAP)[195] were also examined, in order to be confirmed and further investigated by fieldwork and collaboration with the competent Authorities (quite often sites which have been favourable to agriculture). The specific tasks of the desktop study can be summarized as follows

- Literature Review of Prehistoric and Historic Period, including cultural patterns for Greece, and particularly Macedonia and Thrace, aiming to provide an understanding of the context and setting of the study areas, where the TAP Greece Project will be implemented.
- Compilation of lists of known sites through literature review.
- Identification of areas with a High Potential to contain unknown archaeological sites, within the 2 km corridor.

The desktop study included research, collection and analysis of relevant data from the Database of the Ministry of Culture[196], archaeological and historical literature, maps and satellite imagery. The referenced sources were found on the internet and in international, national and regional institutions such as libraries, universities, museums and research institutions. The Ephorates also provided information about several, previously unknown or unconfirmed archaeological sites within the 2km corridor, either digitally or through official correspondence.

[195] Areas of high archaeological potential were determined by the judgement of archaeological specialists with respect to an area's potential to contain undiscovered sites. This determination is based on a variety of factors, including the presence of known cultural heritage sites in the vicinity, typical ancient settlement patterns in the region, the level of ground disturbance in the area, and geographical features which will have made an area attractive to human inhabitants, such as topography, the presence of flat, arable land, water sources, and other natural resources.
[196] listedmonuments.culture.gr

6.5.2.3 Fieldwork

Field surveys were conducted in selected areas, within the 2 km corridor of the TAP Project (see Annex 4.7) in October 2011 for the West Section and November 2012 and February 2013 for the East Section following desktop and routing studies. The field survey activities were designed to further the investigation, verification and refinement of cultural heritage sites or AHAP, previously identified as a result of desktop study. It should be noted that in several cases, exact boundaries of the cultural heritage sites could not be identified. This is due to to lack of available, official data or due to the need of an intrusional (and not exploratory) field work. The location of such cultural heritage sites is presented approximately. Another aim of the fieldwork was the investigation and discovery of potential new cultural heritage sites or AHAP which were not known during the earlier researches. In this direction, consultation with other experts from the competent authorities (EPCA/EBA), with field maps, constituted an integral part of the fieldwork.

Field survey methodology primarily was connected to exploratory reconnaissance, including distinction of specific areas that were identified as AHAP during prior desktop research. For the ESIA fieldwork, a team of at least one experienced archaeologist and a route expert, conducted pedestrian field surveys in selected areas of the 2 km corridor. In almost all of the site visits, representatives of the competent archaeological authorities were also present. In some cases cultural heritage study areas during the field surveys included more than one site, such as the occasions of Palaio Katramio 2 (two tombs in proximity), Sounio (two tombs in proximity) at the Regional Entity of Xanthi, or Amaxades and Koptero (two tombs in proximity) at the Regional Entity of Rhodopi. Existing tombs, investigated during the fieldwork at the Regional Entities of Xanthi and Rhodopi, are likely interconnected; this is based on their proximity to each other and their density. In addition due to the different concept for the regional boundaries in ancient times there weren't any distinctions in regional entities, like nowadays, a factor which favours the potential connection of the tombs.

The CH team also conducted field surveys at segments of the pipeline route and at various areas, investigated for the installation of project components[197]. The CH areas and the areas with high, medium or low archaeological potential within the 2 km corridor that have been investigated during the field work are shown in the map of *Annex 4.7 – Cultural Heritage*.

[197] These locations are referring to the compressor station in the broader area of Thessaloniki that were initially investigated for GCS01 and in the broader area near the Greek/ Albanian borders initially investigated for GCS02. However, due to the ongoing design of the project, these locations have been discarded. The new locations for GCS01, in the broader area of Serres, have not been ground-truthed. Data for these locations have been provided by official available data, correspondence and literature review.

The surveyed areas were identified and recorded by a qualitative assessment of archaeological sensitivity and criteria, according to the TAP Project guidelines, the desktop study and the experience of the archaeologists, both from the CH team of ESIA and from the Ephorates of Antiquities (EPCA/EBA).

The field surveys resulted in the enrichment of the existing information, by identifying areas of high archaeological potential or areas of high informational value and by providing previously unknown evidence for archaeological sites. Aiming at a representative understanding of the baseline conditions in the 2km corridor, both data from the desktop study and the fieldwork were used. The selected areas of the field survey were investigated in proportion to the density of the CH sites identified during the desktop study and in accordance with the Ephorates' suggestions. No intrusive methods were used. No statistical model of ancient settlement patterns was developed for this section of the Project. Further descriptions for the conduction and the methodology of the ESIA field surveys are provided in the relevant *Annex 6.4.0 – Supporting Materials Cultural Heritage Baseline*.

6.5.3 Cultural Heritage Findings

For the East Section (KP 0 – 359), the presentation of cultural heritage findings along the base case route has been separated in six sections, according to the Regional Entities in which they are located. The sections include Regional Entity of Evros, Regional Entity of Rhodopi, Regional Entity of Xanthi, Regional Entity of Kavala, Regional Entity of Serres and Regional Entity of Thessaloniki.

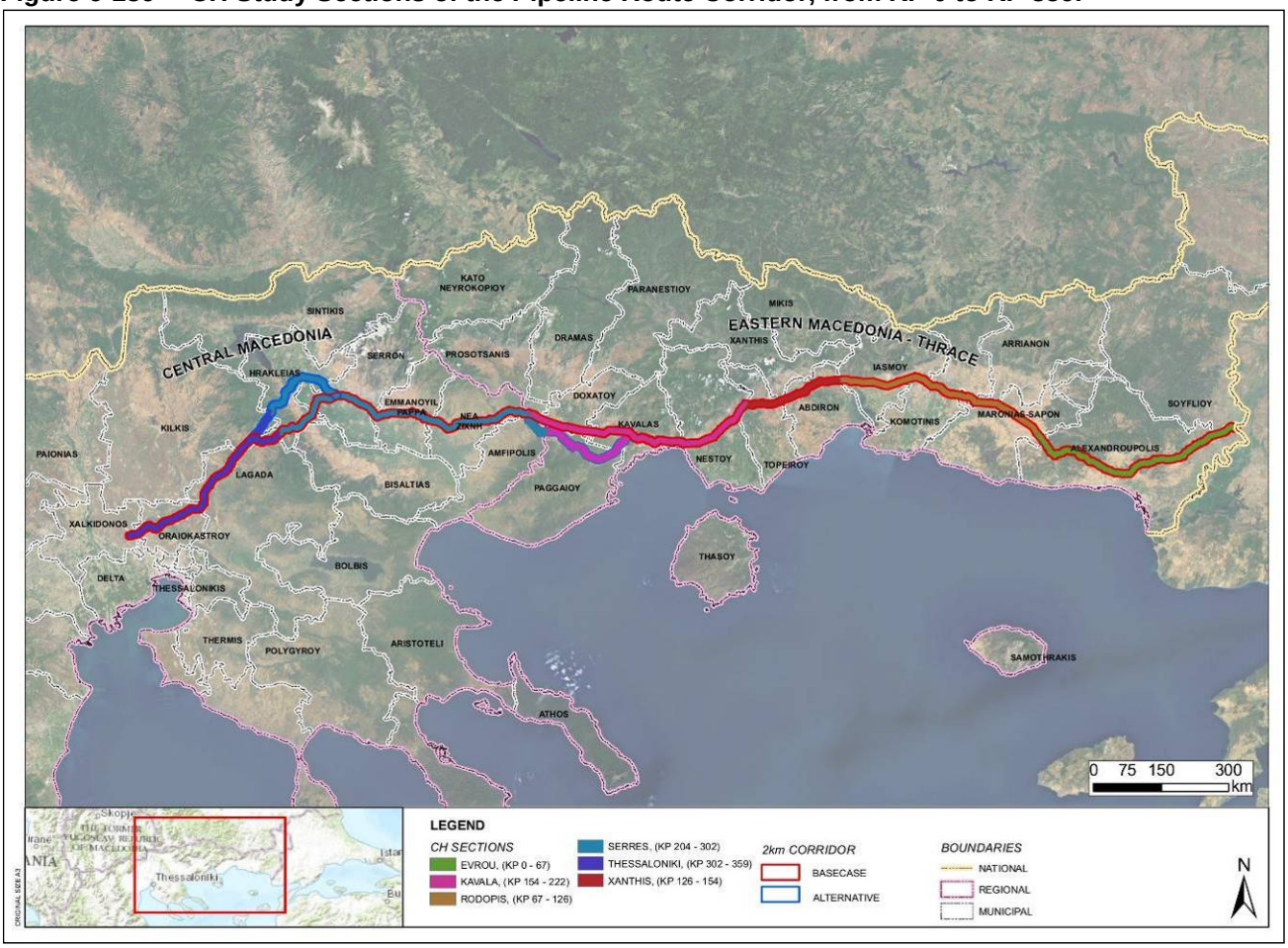
A map of the Project area, showing these sections is provided in *Figure 6-139*[198,199]. For the West Section (KP 359 – 543), the presentation of cultural heritage findings along the base case route has been separated into five sections: the Axios Plain, Vermio Mountain, Ptolemaida Basin,

[198] Cultural heritage sites within Regional Entity of Drama are managed by Authorities of Kavala Regional Entity (12th EBA and 17th EPCA) and are described in the relevant section. Similarly, cultural heritage sites within Regional Entity of Kilkis are managed by the Authorities of Thessaloniki Regional Entity (9th EBA and 16th EPCA) and are described in the relevant section.

[199] It is highlighted that during the preparation of the present cultural heritage baseline report, the investigated basecase of the pipeline route was modified, from KP 195 to KP 220 and from KP 281 to KP 310. Areas of interest within the initial basecase (alternative corridor in *Figure 6-139*) have been ground-truthed, whereas sites along the modified section (basecase corridor in *Figure 6-139*) have not been ground-truthed, but investigated through officially available data, correspondence with the competent authorities and literature sources. Some of these areas are scheduled to be surveyd at a later date

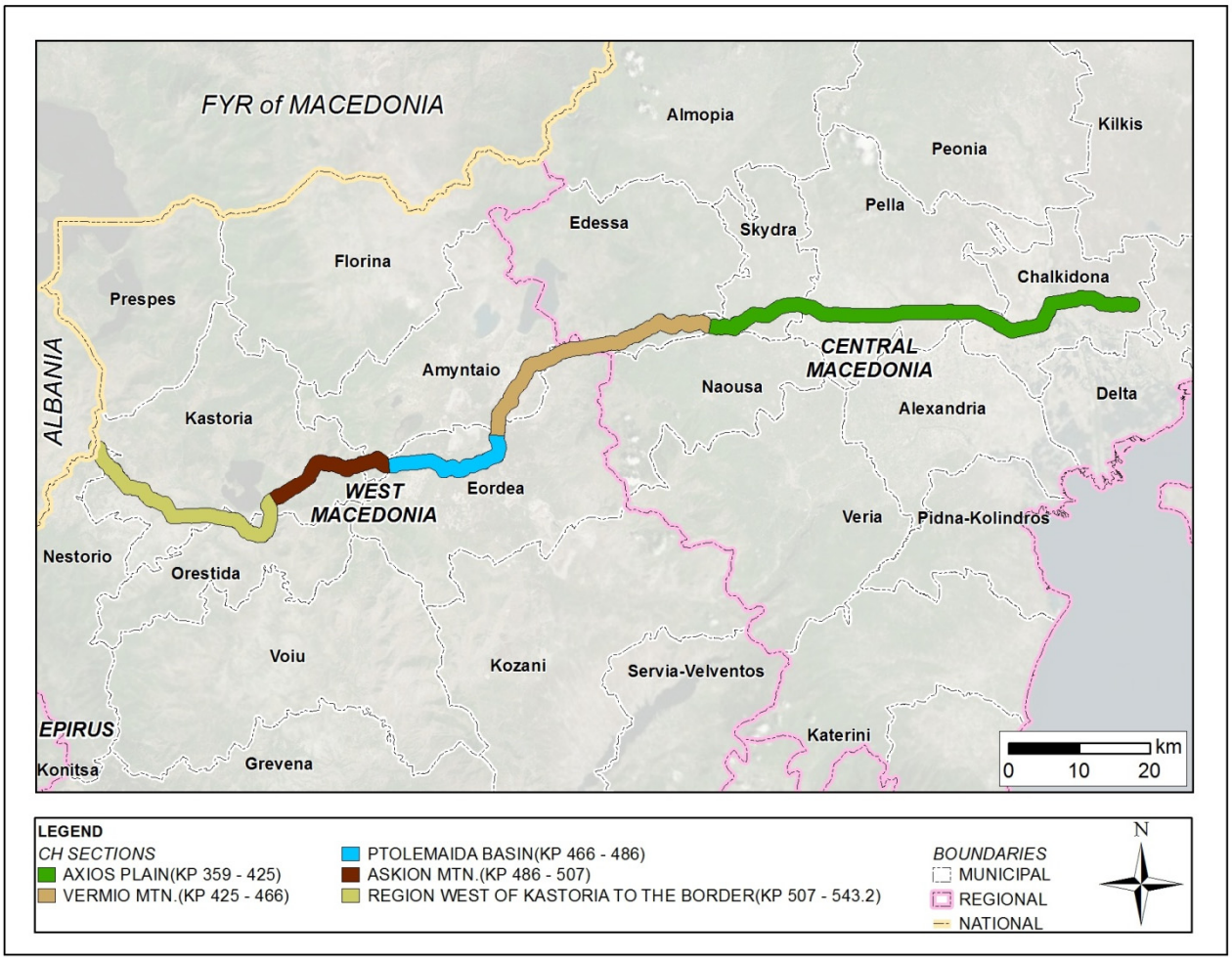
Askion Mountain, and the Region West of Kastoria to border. A map of the Project area showing these sections is provided in *Figure 6-140*.

Figure 6-139 CH Study Sections of the Pipeline Route Corridor, from KP 0 to KP 359.



Source: ASPROFOS (2013)

Figure 6-140 Study Sections of the Pipeline Route Corridor from KP 359 to KP 543.



Source: ERM (2012)

The assessment of the importance/quality of CH sites constituted an integral part of the Baseline Studies. Evaluation of importance/quality of CH sites is connected to the Impact Assessment portion for the ESIA (see Chapter 8). The importance and quality ratings were defined by different criteria for the different CH site types. The criteria used in the assessment of the identified CH sites area described in *Table 6-128.*

Table 6-128 Cultural Heritage Site Importance/Quality Criteria

	Low	***Moderate***	***High***
Archaeological Site	Limited informational value and/or cultural significance based on content and condition of site.	Moderate informational value and/or cultural significance based on content and condition of site.	High informational value and/or cultural significance based on content and condition of site. Meets criteria as Critical Cultural Heritage[200] or Non replicable Cultural Heritage as defined by PS8[201].
Monument	Limited visual, commemorative or art historical interest based on architectural style or degree of preservation.	Moderate visual, commemorative or art historical interest based on architectural style or degree of preservation.	High visual, commemorative or art historical interest based architectural style or degree of preservation. Meets criteria as Nonreplicable Cultural Heritage as defined by PS8.
Site with Intangible Cultural Heritage Value (IGH)	Limited cultural or religious significance to site users based on user criteria.	Moderate cultural or religious significance to site users based on user criteria. Meets criteria as Critical Cultural Heritage as defined by PS8.	High cultural or religious significance to site users based on user criteria. Meets criteria as Critical Cultural Heritage as defined by PS8, and is either recognized regionally or nationally as an important symbol of culture and identity, or as a uniquely important site for a particular group (community, ethnic group, minority religious group, etc…)

Source: ERM (2012)

6.5.3.1 Historic and Cultural Context of the Project Area

The Project area is located in the region of Thrace and Macedonia, which occupies the northernmost part of continental Greece. Various geological incidents of the distant past have created substantial topographic relief in this region, especially in western Macedonia. The mountainous hinterland is interrupted by fertile alluvium and diluvium basins, watered by significant drainage systems such as the Aliakmonas River to the West, Axios and Strymonas Rivers to the central area, Nestos and Evros Rivers to the East. Located between continental Europe and the Mediterranean, this region has been favourable to human settlement for centuries, due to the rich vegetation, abundant water supply, mineral deposits and temperate climate. Additional attractive factors have included its strategic location in one of the Balkan

[200]International Finance Corporation (IFC) Performance Standard 8 (PS8) defines Critical Cultural Heritage as one or both of the following: "(i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation.

[201]International Finance Corporation (IFC) Performance Standard 8 (PS8) defines Nonreplicable Cultural Heritage as relating to "social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site."

Peninsula's significant centres of production and population. Due to its central location as southern entryway from Asia to Europe, the area has been subject to migration and shifts in population and demographics, which have shaped a complex cultural history. Greece's archaeological and historical wealth is evident in this region from vestiges of both prehistoric indigenous cultures as well foreign imperial influences including the Roman and Ottoman empires. Some areas of the Project area have distinctive historical trajectories due to geographical conditions in ancient and historic times. For example, the ancient capital of Pella was originally a port on an inlet of the sea, which had silted up by the Roman period. Thus, no evidence of human habitation predating the Roman period is expected to occur between KP 369 and 390 on the Axios Plain. These factors are taken into account in the preparation and planning of the baseline survey work.

Table 6-129 presents a brief timeline of Greek history and prehistory, with a focus on the region of Macedonia and Thrace. The information presented in the timeline was developed as part of the desk study from standard published sources. The timeline provides a wider context for understanding and evaluating cultural heritage sites present in the Project area. A more lengthy discussion of Greek historic and archaeological periods is presented in *Annex 6.4*.

Table 6-129 General Timeline of Greek Prehistory and History with focus in the Region of Macedonia and Thrace

Period	***Date***	***Characteristic Traits and Major Events***
Paleolithic Period	250,000 – 10,000 BC	Small mobile Pleistocene (Ice Age) social groups living by a foraging economy; before the domestication of plants and animals.
Mesolithic Period	10,000 – 6,000 BC	Intensive foraging economy relying on more abundant post-Pleistocene resources; use of microlithic stone tool sets; beginning of plant domestication and ceramics.
Neolithic Period	6,000 – 3,000 BC	Emergence of village life dependant on domesticated plants and animals; larger, permanent settlements; earliest permanent architecture; developed crafts; beginnings metallurgy.
Bronze Age (includes Early, Middle and Late Bronze Age)	3,000 – 1,050 BC	Beginnings of social stratification with leadership based on success in combat; use of bronze tools and weapons; warrior-leaders are memorialized with *tumuli* with grave offerings; long-distance trade plays an important role in society.
Early Iron Age	1,050 – 800 BC	Continuation of same Bronze Age cultural trends; forts on hill tops and other naturally fortified areas are common; development of oral literature such as the *Iliad and Odyssey; use of i*ron tools and weapons.
Archaic Period	800 – 500 BC	Era of development, trade and prosperity; predominance of the Ionic architectural order.

Period	*Date*	*Characteristic Traits and Major Events*
Classical Period	500 – 323 BC	Development of classical Greek civilization; Persian Wars;; Phillip II; Alexander the Great; expansion of Macedonia and the spread of Greek culture.
Hellenistic Period	323 – 146 BC	Macedonia continues to be a centre for political affairs; northern invasions.
Roman Period	146 BC – AD 330	Roman imperial conquest of the region; Pax Romana; construction of Via Egnatia.
Byzantine Period	AD 330 – 1453	Adoption of Christianity by Roman Empire; East-West schism; further fragmentation of empire and rise of localized feudal economies; Slavic invasions.
Ottoman Period (Post Byzantine)	15th century – early 19th century	Control of the Ottoman empire over Macedonia; forced conversion to Islam but Orthodox Christianity remained a strong force; greater European influence; struggle for Greek independence.
Modern Period	Late 19th century – Present	Balkan wars; liberation achieved in 1912; WWI and WWII; formation of modern Greek national identity.

* Dates are approximate

Source: ERM (2012), ASPROFOS (2013)

6.5.3.2 Cultural Heritage Sites and Areas of High Archaeological Potential

CH sites were classified as of Low, Moderate/Medium and High significance, according to their Cultural Significance based on content and condition of site, according to the quality criteria presented above. In some cases, it was possible to have official characterization of a site's importance. However, the importance of several sites is provided approximately, based on the ESIA team judgement correlated with the criteria presented in *Table 6-128.*

Identified Cultural Heritage (CH) sites, Areas of High Archaeological Potential (AHAP) and Cultural Heritage sites with of Intangible value (ICH), within the study area of the 2 km corridor of the pipeline, are illustrated in the map of *Annex 4.7 – Cultural Heritage.*

Potential impacts and proposed mitigation for the cultural heritage resources identified within a 50 m corridor of the pipeline and/ or are likely to be impacted by the project are discussed in *Section 8.17*

6.5.3.2.1 Regional Entity of Evros (KP 0 – 67)

A total of 51 cultural heritage sites were identified within the 2 km wide corridor in Evros Regional Entity section (from KP 0 to KP 67, approximately). Two (2) more were identified outside the 2 km corridor. The sites vary in their size, type and importance. Archaeological sites predominated in Evros Regional Entity, with 26 Archaeological Sites, 13 ICH sites, 7 AHAP, 3 sites with both M and ICH value, one (1) with both AS and ICH value and one (1) with both ICH and AHAP value. Field survey was performed in 26 of these sites providing updated information. Of the 51 sites identified, 13 are of low importance and/or quality, 7 are of moderate importance and/or quality, and 31 are of high importance and/or quality. Site types along this section include:

- Burial sites (burial mound, cist graves)
- Pottery, ceramic and tile scatters
- Churches and chapels (post Byzantine, 19th century, modern)
- Cultural mounds
- Fossilized wood remains
- Settlements and fortifications
- Stone made vaulted pipeline
- WWII installments

The most notable sites from this region include: The Iron Age settlement and Roman fortification in Kavisos (CH-79-E), the cultural mounds in Peplos (CH-373-E, CH-356-E, CH-227-E) and in Tavri (CH-390-E), cultural mounds in Pylaia (CH-345-E, CH-346-E, CH-358-E), the monastery of Agios Prodromos (CH-374-E) in Aetochorio, a cultural mound between Antheia- Aetochorio (CH-348-E), the church of Profitis Elias in Amfitriti (CH-18-E), part of an aqueduct system in Amfitriti (CH-335-E), churches and chapels (CH-325-E, CH-339-E, CH-340-E, CH-341-E, CH-372-E) and a stone paved road (CH-394-E) in Palagia, a fire tower on a mountain top in Sykorrachi within an archaeologically sensitive area with a commanding view of the gulf of Alexandroupolis (CH-334-E), and an extensive pottery scatter with indications of a cultural mound (CH-388-E, CH-389-E), also in Sykorachi.

An inventory of the cultural heritage sites identified in Evros Regional Entity is presented below in *Table 6-130*. The density of reported archaeological sites and areas of high archaeological potential suggests that Evros is a section of moderate to high archaeological potential. A number

of additional undiscovered sites and archaeological resources are likely to be present within this section of the base case corridor.

Of the 51 cultural heritage sites identified within the study area, 17 sites are located in close enough proximity to the Project footprint to potentially incur impacts from Project activities (approx. 50 m). The exact location of another site where chance findings were recorded, (CH-327-E) in Peplos area is currently unsafe but it could also lie within 50 m from the project footprint.

The following sites pose the greatest constraints to the Project, both for their importance and their vicinity to Project activities:

- CH-350-E, a cist grave site in Itea (near KP 11, approx. 50 m from the pipeline). The site although outside the regular working strip poses a concern because of its location within a wider archaeologically sensitive area
- CH-352-E, an area of round burial structures and a byzantine wall in Kavissos (near KP 14, within 50 m from a logistic road)
- CH-250-E, an ancient tomb located within 50 m from a logistic road, in Pylaya (near KP 21)
- A cultural mound (CH346-E) and a low density pottery scatter (CH-347-E) that might extend within the regular working strip, near Pylaia (near KP 22)
- CH-383-E, a possible cultural cairn, intersecting the regular working strip and possibly the centreline, in Pefka (near KP 26)
- CH-335-E a stone made pipeline which is regarded as part of a wider pipeline system, in Amfitriti, (near KP 41, approx. 2 m from the pipeline)
- CH-336-E, a road shrine in an area with archaeological potential, also, in Amfitriti, (near KP 41, approx. 37 m from the pipeline)
- CH-376-E, a sporadic pottery scatter, which unknown subsurface features could intersect the centreline and the BVS02, (near KP 42)
- CH-394-E a stone paved road intersecting the regular working strip and possibly the centreline, in Amfitriti, (near KP 46)
- churches and chapels (CH-339-E near KP 46, approx. 28 m from the pipeline, CH-370-E near KP 45, approx. 62 m from the pipeline). The chapel of Agios Markos (CH-339-E) is considered to have an earlier phase and is possibly related to the nearby stone paved road (CH-394-E) both located within an area of high archaeological potential.

- a pill box dating from the WWII (CH-333-E near KP 59, approx. 30 m from the pipeline) and a fire tower (CH-334-E near KP 57, approx. 25 m from the pipeline) within an area of high archaeological potential in Sykorachi.
- CH-388-E, at KP 62- 63, a pottery scatter which intersects the regular working strip and
- the adjacent possible cultural mound (CH389-E) at KP 62- 63, that possibly intersects the regular working strip.

Table 6-130 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Evros Regional Entity.

km Point KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Evros									
3	CH-327-E	15th EBA	Peplos1	252	A	Chance findings recorded in the fields by the river;	Uncertain	unknown	L
3	CH-357-E	Field Survey	Peplos6	243/ 230 from GCS00-B	A	An area with a clump of trees close to Peplos5. Possibly the location of a cultural mound. A stone fragment possibly with a worked surface. Information on ancient tombs in this area;	Uncertain	Y	H
3	CH-356-E	Field Survey	Peplos5	225/ 182 from GCS00-B	A, ICH	A mound covered with bushes within cultivated fields. A depression on top most probably indicates a recently pillaged tomb. Second hole possibly belongs to a military pill box. One cylindric handle in the surrounding fields;	Uncertain	Y	H
5	CH-355-E	Field Survey	Peplos4	942	A	Ancient graves recorded;	Uncertain	Y	H
5	CH-328-E	15th EBA	Peplos3	144	ICH	Fossilized wood remains;	Uncertain	unknown	L
6	CH-373-E	19th EBA	Peplos8	460	A	Burial mound;	Uncertain	unknown	H
6	CH-365-E	Literature review	Peplos7	469	AHAP	Place name Aspri Petra (*White Stone*). Possible indication of an ancient site.	Uncertain	unknown	L
7	CH-390-E	Field Survey	TavriA	878	A	Cultural mound.	Uncertain	Y	H
9	CH-227-E	19th EPCA	Peplos2	906	A	Indications of a cultural mound;	Uncertain	unknown	H
11	CH-350-E	Field Survey	Itea6	19	A	Cist grave excavation on a small rise. Burials were also investigated at the nearby DESFA plant;	Uncertain	Y	H
13	CH-351-E	Field Survey	Kavisos6	536	AHAP	Location of a quarry in the edge of mound Makrylofos or Doryianni. A coin hoard possibly comes from this area;	Uncertain	Y	M
13	CH-321-E	19th EPCA	Itea2	198	A	Cultural mound;	Uncertain	unknown	H
13	CH-352-E	19th EPCA	Kavisos-Ardani	378	A	Indications of ancient tombs;	Uncertain	unknown	H

km Point KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
14	CH-79-E	19th EPCA	Kavisos9	453	A	Round burial structures with cremations recorded in the area. Also a reference for a wall built with mortar possibly of Byzantine date in the wider area;	Uncertain, possibly Byzantine	Y	H
14	CH-363-E	Literature review	Kavisos2	453	A	Iron age settlement. Dry stone wall remains, pottery scatters. Late roman fortification. In the fields at the foothill pottery scatters extending in 5,25 ha. In the same area, close to the hill pottery scatter extending approx.1 ha dating from the I.A.;	Iron Age,Late roman	Y	H
18	CH-250-E	Literature review	Kavisos10	992	AHAP	Place name Aspra Chomata (*White Soil* area). Possible indication of an ancient site;	Uncertain	unknown	L
20	CH-345-E	19th EBA	Pylaia2	75	AHAP	Kapsala mound. Possibly archaeologically sensitive area;	Uncertain	unknown	M
21	CH-358-E	19th EBA	Pylaia1	131	A	Information on ancient tomb;	Uncertain	unknown	H
22	CH-347-E	Field Survey	PylaiaA	74	A	A cultural mound. On top at least three depressions, possibly indicate pillaged graves;	Uncertain	Y	H
22	CH-346-E	Field Survey	PylaiaC	131	A	A mound close to Pylaia A, B sites. Possibly a cultural mound;	Uncertain	Y	H
22	CH-331-E	Field Survey	PylaiaD	693	A	Low density pottery scatter in an uncultivated field. Sporadic undecorated sherds, roof tiles;	Uncertain	Y	M
22	CH-383-E	Field Survey	PylaiaB	51	A	A cultural mound. Pottery scatters in the surrounding fields;	Uncertain. Possibly prehistoric, classic, hellenistic	Y	H
24	CH-327-E	19th EPCA	Pylaia-Pefka	693	A	Pottery scatter;	Uncertain	Y*	H
26	CH-357-E	Literature Review	PefkaA	3	A	Possibly cultural cairn	Uncertain	Y*	L
32	CH-11-E	19th EPCA	Aetochorio2	507	A	Chance findings. Early christian spolia;	early christian	unknown	L

km Point KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
32	CH-374-E	Literature review	Aetochorio1	48	ICH	Unknown chapel (Possibly monastery of Timios Prodromos)	Uncertain	unknown	H
33	CH-348-E	Field Survey	Antheia-Aetochorio1.	113	A	Top of a mound close to DESFA facilities. Low density pottery scatters in the surrounding fields;	Uncertain	Y	H
33	CH-349-E	Field Survey	Antheia-Aetochorio2.	195	ICH	Road shrine dedicated to St. George;	Modern	Y	L
41	CH-338-E	Field Survey	Amfitriti6	126	ICH	Chapel of AghiosGeorghios, on a mound with good views of the surroundings. Water stream nearby.	Uncertain	Y	H
41	CH-335-E	Field Survey	Amfitriti3	2	A	Part of an underground stone made vaulted aqueduct excavated during the construction of DESFA pipeline. Possibly related to the pipeline system recorded in Loutros area.	Uncertain, possibly modern	Y	H
41	CH-369-E	Literature Review	Amfitriti7	282	ICH	Unknown chapel;	Uncertain	unknown	H
41	CH-336-E	Field Survey	Amfitriti4	37	ICH	Road shrine dedicated to Virgin Mary (Panagia).	Modern	Y	L
42	CH-18-E	15th EBA	Amfitriti2	625	M, ICH	Church of Profitis Elias;	Possibly post byzantine	unknown	H
42	CH-376-E	Field Survey	AmfitritiA	45/ 5 from GBVS02	A	Sporadic pottery	Uncertain	N	L
43	CH-325-E	Literature review	Palagia4	532	ICH	Chapel	Possibly modern	unknown	M
43	CH-330-E	Literature review	Potamos2	636	ICH	Abandoned Potamos settlement;	Possibly pre-modern	unknown	M
43	CH-371-E	Literature review	Palagia11	786	AHAP	Place name Paliochori (old village).Possible indication of an ancient site;	Uncertain	unknown	L
44	CH-379-E	Field Survey	PalagiaB	>1000	A	Sporadic pottery fragments	Uncertain	Y	L
44	CH-378-E	Field Survey	PalagiaA	>1000	A	Low density pottery scatter.	Uncertain	Y	L

km Point KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
45	CH-370-E	Literature review	Palagia10	62	ICH	Unknown church;	Uncertain	unknown	H
45	CH-372-E	Literature review	Palagia9	160	ICH	Church of Agia Triada;	Uncertain	unknown	H
45	CH-341-E	Field Survey	Palagia8(Agia Anna)	604	M, ICH	Church of Aghios Dimitrios dated from 1843. Also site of local 1st of May festival;	19 th century	Y	H
45	CH-340-E	Field Survey	Palagia7	765	M, ICH,	Stone made chapel of Aghios Nikolaos, dated from 1881. Sporadic roof tiles in the surrounding fields;	19 th century	Y	H
46	CH-394-E	Oral information by a local resident	Palagia13	3	ICH	Stone paved road close to Ag. Markos chapel leading from Aliki to Iana. Crosses the existing Desfa pipeline.	Uncertain	Y (note1)	H
46	CH-339-E	Field Survey	Palagia6	28	ICH	Chapel of Aghios Markos. Commanding view of the surroundings. In the fields around the church sporadic tiles, possibly related to the old village of Agia Anna; Oral information on older phase of the chapel and on ancient burials nearby.	Modern	Y	H
52	CH-395-E	Field Survey	Sykorachi14	482	A	Indications of burials	Uncertain	unknown	M
54	CH-366-E	Literature review	Sykorrachi8	713	AHAP	Place name Aspropetra (white stone). Possible indication of an ancient site;	Uncertain	unknown	L
57	CH-334-E	Field Survey	Sykorrachi5	25	ICH, AHAP	Fire tower on a wooded mountain top with commanding view of the surroundings and the gulf of Alexandroupolis. Site located within an archaeologically sensitive area on the basis of topography and information on two possible CH sites to the south slope (Piren bounar and Kouz bounar-see CH 359, CH 360) . No visible archaeological indications in the fire tower area during site visit though.	Uncertain	Y	H
59	CH-278-E	15th EBA	Sykorrachi2	617	A	Chance findings (marble column, small	Uncertain	unknown	L

km Point KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
						size fusiform pots) indicating a settlement;			
59	CH-333-E	Field Survey	Sykorrachi4	30	ICH	Stone made pillbox on a wooded slope constructed in the era of I. Metaxas (WWII).	Modern (second world war)	Y	M
63	CH-388-E	Field Survey	SykorachiA	7	A	Extensive low to medium density pottery scatter.	Uncertain	Y	H
63	CH-389-E	Field Survey	Sykorachib	21	A	Small rise of the ground with a concentration of rocks. Possible indication of a mound	Uncertain	Y	H
64	CH-367-E	Literature review	Sykorrachi9	389	AHAP	Place name Asvestaries(lime pits).Possible indication of ancient site	Uncertain	unknown	L

Notes

Site Types	
A	Arcaheological Site
AHAP	Area of High Archaeological Potential
ICH	Site with Intagible Cultural Heritage
M	Monument
Site Importance	
H	High
M	Moderate/Medium
L	Low

Note1 *denotes that the site was identified by the Ephorates or by other knowledgeable individuals, not assessed with CH importance/quality criteria but assumed to be of High importance*

Source: EXERGIA (2013)

6.5.3.2.2 Regional Entity of Rhodopi (KP 67 – 126)

A total of 22 cultural heritage sites were identified within the 2 km wide corridor in Rhodopi Regional Entity section (from KP 67 to KP 126, approximately). Seven (7) more were identified outside the 2 km corridor. The sites vary in their size, type and importance. Archaeological sites predominated in the Rhodopi Regional Entity (15 in all) whilst seven (7) AHAP were identified. Of the 22 sites identified, seven (7) are of low importance and/or quality, three (3) are of moderate importance and/or quality, and 12 are of high importance and/or quality. 12 Cultural Heritage sites were visited. These areas, in some cases, are considered as traced archaeological areas by the Ephorates, due either to Literary Sources, to surface indications or to archaeological findings, traced at nearby areas in the past.

Regional Entity of Rhodopi and the wider area of Thrace, is characterized by the cultural evolution and interactions with the wider area of the South-east Europe, from the Neolithic Period. This is due to the general geomorphological context of Thrace. The dominant geophysical characteristics of the area and further environmental parameters, including rivers, lakes and coastal areas, are of utmost importance in creating favorable or negative conditions for prehistoric settlements. Nevertheless, archaeological research of Thrace has not been as extensive as in the area of Macedonia, yet.

Cultural Heritage sites in this section mainly include

- Prehistoric tombs, in relevantly high frequency, of the Neolithic Period and of other undetermined periods. Six tombs were investigated at the wider area of Komotini during the Field Survey of November 2012.
- Byzantine (Justinian) Walls and Aqueduct.
- Fortress of the Classical Period.
- Byzantine architectural parts and remnants.
- Ceramic scatters of the Neolithic, Classical, Byzantine, Ottoman Period (/Post-Byzantine) and Historic Times.

In addition to the selected areas of the field survey, at the wider area of Komotini two route surveys were conducted. These are described in CH-33-E ‘Koptero 3’ and CH-34-E ‘Galini’ sites.

These areas were selected due to relevant, literary references and due to the existence of associated areas of High Archaeological Potential. The route survey at the section of Koptero and Galini did not confirm evidenence of High Archaeological Potential or informational value.

The most important of the investigated sites, at the Regional Entity of Rhodopi, is CH-36-E 'Justinian Walls and Aqueduct', an officially recognized Archaeological site, as it directly intersects the centerline of the pipeline. The Justinian Walls and Aqueduct are extended in all the length of the 2 km corridor of the pipeline aboveground and underground. Thus CH-36-E site will be subject to the impacts of the Project activities. Therefore, further consultations with the competent authorities are essential, as was the case with other similar projects in the area, in the past. In addition, two sites near Pamforo could be impacted by the project (i) CH-354-E of low density ceramic scatter on a mound, (subsurface features possibly extend to the centreline), intersecting the centreline near KP 83-84, and (ii) CH-353-E of low to medium density ceramic scatter possibly with subsurface features extending to the centreline near KP 83-84. Pottery scatters (CH-391-E) in Thrylorio could also be impacted.

Among the various CH sites identified in the regional entity of Rhodopi, two are considered important, but could not be efficiently documented (with coordinates), and their location is indicative. These are

- CH-2LR-E, (sourced by the listed monuments of the Greek Ministry of Culture) 'Anastasioupolis – Peritheorion', where remnants of the Byzantine town of Anastasioupolis – Peritheorion are identified.
- CH-14LR-E, (sourced by the listed monuments of the Greek Ministry of Culture) 'Galini 2', at the location Anachoma or Kavela Gentsini, where stone architectural parts, indications of a settlement of the Roman Period, are identified.

Table 6-131 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Rhodopi Regional Entity.

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Rhodopi									
68	CH-301-E	Literature review	Chamilo1	140	AHAP	Place name "mandres"(walls) Possible indication of an ancient site	Uncertain	unknown	L
73	CH-309-E	19th EPCA/ 15th EBA	Aetolofos2	>1,000	A	Road sign"milliario". Close to this site a stone paved road, locally known as "Egnatia".	Possibly Roman period.1st half of the 3rd century AD	Y	H
78	CH-115-E	Literature review	Lofario1	956	A	Chance finding. Bronze statuette of Hermes.	Uncertain	unknown	L
83	CH-364-E	Literature review	Pamforo-Archontika	560	AHAP	Place name Plystario (wash area). Possible indication of ancient site	Uncertain	unknown	L
84	CH-354-E	Field Survey	Pamforo B	29	A	Low density pottery scatter ,stone scatter. A rising of the ground possibly indicates a mound	Uncertain (possibly hellenistic, pre-modern)	Y	H
84	CH-353-E	Field Survey	Pamforo A	40	A	Low-medium density pottery scatter	Uncertain (possibly hellenistic, pre-modern)	Y	M
86	CH-23LR-E	Greek Ministry of Culture	Amarandos tomb	>1,000	A	Prehistoric tomb, southwest of the village Amarantos. Officially recognized archaeological site	Prehistoric	Y	H
87	CH-391-E	Field Survey	ThrylorioA	0	A	Low density pottery scatter	Uncertain	Y	M
88	CH-368-E	Literature review	Thrylorio2	118	AHAP	Place name Aspropetra (white stone) Possible indication of ancient site	Uncertain	unknown	L
99	CH-11LR-E	Greek Ministry of Culture	Paradimi tomb	>1,000	A	Prehistoric tomb, at the area of Paradimi. Officially recognized archaeological site.	Prehistoric	Y	H
99	CH-3L18th-E	18th EPCA	Yfantes	1,000	A	Prehistoric tomb at the area of Yfantes at Komotini.	Prehistoric	Y	H
104	CH-35-E	Field Survey	Maximianoupoli	800	A	Architectural parts and dense pottery were traced around the ByzantineChurch and Walls of the officially recognized Archaeological site of Maximianoupoli. Four shreds of the Ottoman Period were	Byzantine, Ottoman	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
						also traced in the investigated area.			
107	CH-4L18th-E	18th EPCA	Sostis	770	A	Prehistoric Settlement	Prehistoric	Y	H
108	CH-5L18th-E	18th EPCA	Linos	>1,000 (Note1)	A	Classical sanctuary and Classical-Hellenistic settlement	Classical,Hellenistic	Y	H
108	CH-28-E	Field Survey	Toumpa Linos	200 (Note1)	A	Tomb and surface ceramic scatters in high density, of the Neolithic Period and probably of the Hellenistic too.Officially recognized archaeological site.	Neolithic and probably Hellenistic too	Y	H
110	CH-34-E	Field Survey	Galini	0	AHAP	Parts of modern roof tiles in low density were identified during the field survey along the route.	-	Y	L
114	CH- 14LR-E	Ministry of Culture	Galini 2	750	A	Stone architectural parts, indications of a settlement of the Roman Period.Officially recognized archaeological site.	Roman probably	Y	H
115	CH-6L18th-E	18th EPCA	Polianthos	>1,000	A	Hellenistic fortress and cemetery.	Hellenistic	Y	H
119	CH-7L18th-E	18th EPCA	Iasmos Fortress	670	A	Small fortress(Soukistra).Officially recognized archaeological site.	Classical	Y	H
119	CH-32-E	Field Survey	Soukistra	450	A	The fortress of Soukistra is a fenced archaeological site, officially recognized. The visibility of the site is extremly limited, due to the densed vegetation. Ceramic scatters in medium density. Part of Via Egnatia is also reported at the area of Soukistra.	Classical	Y	H
119	CH-33-E	Field Survey	Koptero 3	0	AHAP	Three ceramic scatters, probably Historic, roof tiles in medium density and a water pumping station (contemporary) were identified during the field survey along the route.	Uncertain but probably Historic	Y	L
120	CH-31-E	Field Survey	Koptero 2	540	AHAP	Two tombs in proximity one to the other with ceramic scatters in low density.	Uncertain	Y	M
121	CH-29-E	Field Survey	Koptero 1 Tomb	500	AHAP	Low tomb near Egnatia Highway with ceramic scatters in low density. Part of a	Uncertain	Y	L

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
						stone, potentially burial stone, was found on the surface of the petit tomb.			
121	CH-8L18th-E	18th EPCA	Tomb of Koptero	430	A	Burial Tomb	Uncertain	Y	H
121	CH-9L18th-E	18th EPCA	Via Egnatia-Koptero	>1,000	A	Remnants of Via Egnatia	Roman probably	Y	H
123	CH-36-E	Field Survey	Justinian Walls and Aqueduct	0	A	The Justinian Walls and Aqueduct are an extended and officially recognized archaeological site. The site is extended aboveground and underground.	Byzantine	Y	H
125	CH-30-E	Field Survey	Amaxades	105	A	Two tombs, one of bigger and the other of smaller size, located near Egnatia Highway. Stones of small sizes and high density at the surrounding area of the stone and part of a vessel handle (Historic). The proximity of the CH30 site to the officially recognized archaeological area of Amaxades (Prehistoric Tomb) should be further investigated. The area is believed by the Ephorate to incude a Prehistoric tomb and a settlement.	Uncertain	Y	H
125	CH-30a-E	18th EPCA	Amaxades 2	310	A	Prehistoric Settlement	Prehistoric	Y	H
125	CH-2LR-E	Greek Ministry of Culture	Anastasioupolis - Peritheorion	710	A	Remnants of the Byzantine town of Anastasioupolis - Peritheorion. Officially recognized archaeological site.	Byzantine	Y	H
125	CH-10L18th-E	18th EPCA	Amaxades 1	>1,000	A	Prehistoric Tomb	Prehistoric	Y	H

Notes

Site Types	
A	Arcaheological Site
AHAP	Area of High Archaeological Potential
ICH	Site with Intagible Cultural Heritage
M	Monument
Site Importance	
H	High

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
	M	Moderate/Medium							
	L	Low							
	Cultural Heritage Site Number								
	CH	Cultutal Heritage							
	LR	Listed in the official Catalogues of Rhodopi Prefecture							
	L18th	Listed by the 18th Ephorate of Komotini (IH' EPCA)							
	Note1	CH28 and CH5L18th are the same. CH5L18th was listed in the official correspondence of 18th EPCA in the provided location but has been ground-truthed and relocated during the jointly performed Field Survey.							

Source: EXERGIA/ ASPROFOS (2013)

Of the sites inventoried in the Regional Entity of Rhodopi section of the base case study area, six (6) cultural heritage sites were identified within 50 m of the Project footprint, and could be subject to impacts from Project activities. These sites are: pottery scatters (CH-354-E, CH-353-E, CH-391-E, and CH-33-E), a roof tiles scatter (CH34-E) and of course the Justinian Walls and Aqueduct (CH-36-E). CH-33-E and CH-34-E are of low importance whilst CH-353-E and CH-391-E of moderate. CH-354-E and the Justinian Wall are of high importance.

6.5.3.2.3 Regional Entity of Xanthi (KP 126 - 154)

A total of 31 cultural heritage sites were identified within Regional Entity of Xanthi (from KP 126 to KP 154, approximately); 24 within the 2 km corridor and seven (7) more outside the 2 km corridor. Cultural Heritage sites vary in their informational value and importance. 19 Archaeological Sites and 12 AHAP have been identified. Some of the AHAP sites are considered as traced archaeological areas by the Ephorates, due either to literary sources or to archaeological findings traced at the area in the past. Of the 31 sites identified, 4 are of low importance and/or quality, 5 are of moderate importance and/or quality, and 22 are of high importance and/or quality. Field survey was performed in 13 of these sites providing updated information. In most of the investigated areas evidence of illegal activities could be traced, related to sand extraction.

Cultural Heritage sites in this section mainly include

- Tombs in relevantly high frequency, dated in the Neolithic, Classical, Hellenistic and Roman Period. Eight tombs were investigated at the area of Xanthi.
- Ceramic scatters of the Historic Times and the Post-Byzantine Period.
- Architectural parts of the Roman Period.

The number of the tombs investigated within Xanthi Regional Entity, located in relevantly small distances one to the other, is one of the most notable characteristics of the area. The Neolithic tomb - settlement of Diomidia, CH-24-E, an officially recognized Archaeological site, with a protection zone of 500 m, is one of the most important sites that were investigated during the field survey. Equally important are other tombs identified: CH19-E ‘Megalo Tympano’, CH-22-E ‘Palaio Katramio 1’, CH-23-E ‘Palaio Katramio 2’, CH-26-E ‘Simantra’ and CH-27-E ‘Sounio’. In the cases of ‘Palaio Katramio 2’ and ‘Sounio’, there were two tombs in each investigated area.

Based on discussions with the representatives of the Ephorate and taking into account literary sources, the dating of some tombs/ toumpas has been connected with the construction of the ancient Egnatia Road (*Via Egnatia*) during the Imperial Years (Roman Period). Via Egnatia was one of the biggest military and commercial roads of the ancient world. It was constructed at the 2nd century BC. It started from Apollonia and Dyrachio in Illyria (today Albania) and crossed Macedonia until Nestos river, passing through Thrace, continuing to Ellispondos and Byzantium. It was the most important road at the area nearly for two thousand years. The ancient town of Topeiros and the ancient town of Avdira with their ancient cemeteries, are included in the most important Cultural Heritage sites of the area, but were not considered in the present study, due to their distance to project.

An inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Xanthi Regional Entity is presented below in the *Table 6-132*. The density of Areas of High Archaeological Potential suggests that the section of Xanthi is an area of moderate to high archaeological potential. Further undiscovered, underground antiquities are likely to be present within this section of the base case corridor.

Table 6-132 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Xanthi Regional Entity.

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Xanthi									
127	CH-27-E	Field Survey	Sounio	580	AHAP	Two tombs of the Roman Period. Ceramic scatters, probably Historic, stones of medium size and of irregular shape, parts of Modern roof tiles, low density, were found at the area of tomb n. 2. The dating of the two tombs has been connected with the of Via Egnatia at the Imperial Years, according to the Ephorate.	Roman, Historic	Y	M
127	CH-27a-E	31st EPCA	Sounio a	590	A	Tomb of Imperial Times	Imperial	Y	H
127	CH-27b-E	31st EPCA	Sounio b	500	A	Tomb of Imperial Times	Imperial	Y	H
128	CH-26-E	Field Survey	Simantra	50	AHAP	Tomb with no ceramic scatters traced during the field survey. The dating of the tomb has been connected with the construction of Via Egnatia at the Imperial Years, according to the Ephorate.	Imperial Years (Roman)	Y	M
128	CH-26a-E	31st EPCA	Simantra 2	50	A	Installation of Classical Times and burial tomb	Classical	Y	H
130	CH-13LK-E	Greek Ministry of Culture	Polistilo, west of the village	>1,000	A	Prehistoric settlement. Officially recognized archaeological area.	Prehistoric	Y	H
136	CH-25-E	Field Survey	Banks of Kosinthos River	0	AHAP	No visible artifacts at the area. Parts of Modern roof tiles in low density. Graves of the Iron Age and of the Roman Period and a settlement of the Early Bronze Age, had been excavated in the area in the past.	-	Y	M
136	CH-25a-E	31st EPCA	Banks of Kosinthos River 2	50	A	Installation and cemetary of Early Bronze Age, Early Iron Age and Imperial Times	Bronze Age, Iron Age,Imperial Times (Roman)	Y	H
139	CH-23-E	Field Survey	Palaio Katramio 2	458	AHAP	Two tombs with no artifacts at an area where a muslim cemetary is located.	Hellenistic, Historic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
139	CH-23a-E	31st EPCA	Palaio Katramio 2a	559	A	Clusters of 5 tombs of Post-Hellenistic Period	Post-Hellenistic	Y	H
139	CH-24-E	Field Survey	Diomidia Toumpa	820	A	Neolithic settlement. Officially recognized archaeological area, with a protection zone of 500 m.	Neolithic	Y	H
139	CH-24a-E	31st EPCA	Diomidia	>1,000	A	Prehistoric settlement. Officially recognized archaeological area with a protection zone of 500m.	Neolithic	Y	H
139	CH-12L31st-E	31st EPCA	Tekton	750	A	Settlement of the Hellenistic and Imperial Years.	Hellenistic,Imperial	Y	H
140	CH-11L31st-E	31st EPCA	Palaio Katramio 3	711	A	Settlement of the Byzantine and Post-Byzantine Period.	Byzantine	Y	H
141	CH-22-E	Field Survey	Palaio Katramio 1	454	AHAP	Tomb of the Post-Classical Period at the area of a modern muslim cemetary. Ceramic scatters, probably historic, in low density.	Post-Classical, Historic	Y	H
141	CH-22a-E	31st EPCA	Palaio Katramio 1a	4508	A	Tomb of Post-Classical Period.	Post-Classical	Y	H
143	CH-8L31st-E	31st EPCA	Lefki	872	A	Settlement of the Classical Period and of the Hellenistic Period.The exact location of the site is unknown.	Classical, Hellenistic	Y	H
145	CH-21-E	Field Survey	Vaniano	165	AHAP	Wheel-made pottery scatters in low density	Historic	Y	L
145	CH-21a-E	31st EPCA	Vaniano 2	248	A	Installation of Byzantine and Post-Byzantine Times	Byzantine	Y	H
147	CH-20-E	Field Survey	Nea Amisos or Galazia Korifi	20	AHAP	A low hill was visible by a point of Egnatia Highway, with no visible artifacts. Ceramic scatters of the Archaic and the Classical Period of Avdera, as well as architectural parts had been found in past surveys. The connection of the CH-20-E area with the officially recognized Archaeological area of the mound of Galazia Korifi should be further investigated and discussed with the competent Ephorate.	Archaic, Classical	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
147	CH-4L31st-E	31st EPCA	Nea Amisos	>1,000	A	Installation of Archaic and Classical Times	Archaic, Classical	Y	H
150	CH-18-E	Field Survey	Poimni 4, Hill of Ephoron	51	AHAP	No artifacts were traced at the area during the field survey, constituting the area of low archaeological potential. According to the Ephorate, a settlement of the Imperial Years and a settlement of the Post-Byzantine period were known to exist in the area. The indications of the field survey did not provide substantial evidence to this direction.	-	Y	L
150	CH-18a-E	31st EPCA	Poimni	120	A	Installation of Imperial Times and Settlement of Post-Byzantine Period	Imperial and Post-Byzantine	Y	H
150	CH-19-E	Field Survey	Megalo Tympano	>1,000	AHAP	Tomb with no artifact traced during field survey. According to the Ephorate the burial tomb is constructed with materials that include prehistoric ceramic. Two burial tombs are known to exist at the area.	Prehistoric (Iron Age)	Y	L
150	CH-19a-E	31st EPCA	Megalo Tympano 2	>1,000	A	Two burial tombs	Uncertain	Y	H
150	CH-3L31st-E	31st EPCA	Thalassia	340	A	Settlement of Hellenistic and Imperial Times	Hellenistic, Imperial	Y	H
151	CH-17-E	Field Survey	Thalassia 3	357	AHAP	Ceramic scatters in medium density. According to the Ephorate, a Settlement of the Hellenistic and Imperial Years is likely to exist at the area. The indications of the field survey did not provide substantial evidence to this direction.	Historic (and 1 isolated potsherd of the Post-Byzantine period)	Y	M
153	CH-16-E	Field Survey	Kosmiti 2	946	AHAP	Architectural parts made of stone which were transferred there from the ancient Topeiros, according the representative of the Ephorate who attended the field survey.	Roman	Y	M
155	CH-2L31st-E	31st EPCA	Kostmiti 4	>1,000	A	Architectural remnants	Imperial Years (Roman)	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
156	CH-15-E	Field Survey	Kosmiti 1	811	AHAP	Cermic scatters in low density. The location was approached approximately since the exact location of the site of a Settlement of Post-Byzantine Period was not known.	Historic	Y	L
156	CH-1L31st-E	31st EPCA	Kosmiti 3	>1000	A	Installation of Post-Byzantine Times	Post-Byzantine	Y	H

Notes

Site Types	
A	Arcaheological Site
AHAP	Area of High Archaeological Potential
ICH	Site with Intagible Cultural Heritage
M	Monument
Site Importance	
H	High
M	Moderate/Medium
L	Low
Cultural Heritage Site Number	
CH	Cultutal Heritage
L31st	Listed by the 31st Ephorate of Xanthi (LA'EPCA)

Source: ASPROFOS (2013)

Of the sites inventoried in the Regional Entity of Xanthi section of the base case study area, five (5) cultural heritage sites were identified within 50 m of the Project footprint, and could be subject to impacts from Project activities. These sites are: records of potential artifacts (CH-18-E, CH-20-E, and CH-25-E), a cemetery (CH-25a-E) and a tomb (CH-26-E). CH-18-E is of low importance, CH-25-E and CH-26-E of moderate importance, whilst CH-20-E and CH-25a-E are of high importance.

6.5.3.2.4 Regional Entity of Kavala (KP 154 – 222)

A total of 35 cultural heritage sites were identified within Kavala Regional Entity Section (from KP 154 to KP 222, approximately); 18 within the 2 km wide corridor and 17 more outside the 2 km corridor. The sites vary in their size and type but not importance. All of the 25 archaeological sites, three (3) monuments and seven (7) AHAP are deemed of high importance. Field survey was performed in 11 of these sites providing updated information. Cultural Heritage research of Kavala Regional Entity revealed that the area was one of the most archaeologically sensitive areas of TAP Project, where cultural heritage sites were identified in high density. The development and importance of the town of Kavala, is connected to its naturally fortified and geographically privileged location. The west port of the town constituted a convenient natural exit of the Balkan peninsula to the Mediterranean. Furthermore, the main road axis of the communication between East and West, passing through the isthmus, was the only natural passage at the wider area during antiquity. Under these conditions, the town of Kavala was characterized as a location of particular strategic importance and as a transportation and commercial junction of vital importance for northern Greece, from the first stages of its history. The importance of the port of the area became greater during the Roman Period, as Via Egnatia passed in front of the walls of the town.

'Archaeological Area of Philippoi' (CH-73LK-E) is an officially recognized archaeological area and an important archaeological element of the area. This protected area includes the ancient town of Philippoi, its Walls and an Acropolis hill. It also includes part of the location Kalamitsa at the area of the ancient town Antisara,among other antiquities.The pipeline passes at a distance >60 m from the boundaries of the archaeological site of Philippoi and of the suggested protection zone A of Dikili Tas. All these sites are included in the officially recognized site, as provided by the Ministry of Culture.

According to the Ministry of Culture, the ancient city of Philippoi, is one of the most important archaeological sites in Eastern Macedonia. It is located at the boundary of the marshes that cover the southeast part of the plain of Drama. The site was originally colonized by the people of Thasos, who, aware of the area's plentiful supplies of precious metals, timber, and agricultural products, established the city of Krinides in 360 BC. Soon after its establishment, however, Krinides was threatened by the Thracians (365 BC) and turned to King Philip II of Macedon for help. Realizing its economic and strategic potential, Philip conquered, fortified, and renamed the city after himself. Hellenistic Philippi had a fortification wall, a theatre, several public buildings, and private houses. The construction of the Via Egnatia through the city in the second century BC made Philippoi an important regional centre. The dramatic battle of Philippoi, which took place outside the west city walls in 42 BC, was a turning point in the city's history. The city was conquered by Octavian and renamed Colonia Augusta Julia Philippensis. The new Roman colony developed into a financial, administrative, and artistic centre. Another important event marked the city's history a century later. Saint Paul founded the first Christian Church on European soil at Philippi in 49/50 AD.

The establishment of the new religion and the city's proximity to Constantinople, the Roman Empire's new capital, brought new splendour. Three magnificent basilicas and the Octagon complex, the cathedral dedicated to Saint Paul, were erected in the city centre in the fourth-sixth centuries AD. After a series of earthquakes and Slavic raids, the lower city was gradually abandoned early in the seventh century. Philippi survived into the Byzantine period as a fortress, until its final demise in the late fourteenth century, after the Turkish conquest. Excavations at Philippi began in 1914 under the French School at Athens and were resumed by the Greek Archaeological Service and the Archaeological Society at Athens after the Second World. The finds are displayed at the Philippoi Archaeological Museum. It should be noted that the broader area of Ancient Philippoi Town is an area of High Archaeological Potential.

Mount of Paggaio (CH-76LK-E) is another important archaeological element of the broader area. The whole mountain is officially recognized archaeological and historical site. The site of Paggaio includes various protection zones all of which lying at a distance >1000 m from the project. Mount of Paggaio has been officially declared as an archaeological and historical site for the protection of important ancient sites that have been traced there and are dated from the Prehistoric until Post-Byzantine Period. The site of Paggaio includes a significant number of sites, among which settlements, caves, cemeteries, fortress, architectural parts, rock paintings and farmhouses of

various periods. Specific protection zones have been defined by the Greek Ministry of Culture. These are zone A and zone B, which is subdivided in zones B1, B2 and B3. The protection zones define among others, the allowed activities and the relevant circumstances within the areas B1, B2 and B3 of the Protection Zone B. Paggaio mountain was famous for its natural resources (silver and gold). Archaeological research has revealed human presence in the foothills of Paggaio Mountain from the Neolithic Period.

Other important CH sites investigated at the broader area of the project are: (i) CH-20LK-E 'Pirovolio-Ochiro Kokkinochomatos-Sitzak Dere', an officially recognized archaeological area. In this area, a cemetery of the Hellenistic Period at the area of Pirovolio, a settlement of the Byzantine and Post-Byzantine Period at the area of Ochyro Kokkinochomatos, and two towers of the Classical-Hellenistic Period at the area of Sitzak Dere have been identified. Additionally, fortified settlements of WWI are present.

The officially recognized archaeological site of Akondisma, CH-14-E, associated with the remnants of an ancient town, three (3) km east of Nea Karvali, is a very important CH site, reported in many travelogues. Referring to the wider area of Thrace, the CH site of Topeiros is also important and reported in many travelogues. CH-14-E 'Akondisma', despite the distance to the centreline, should be considered of High Importance due to the extensive boundaries of the site and due to its proximity to other CH sites. In addition, site CH-10-E 'Pondolivado' is considered as a cultural heritage site of vital importance.

Other cultural heritage sites are

- CH-12a-E, Paradeisos - Kilisi Tepe, where a Prehistoric settlement is identified,
- CH-4LK-E, Wall of Kavala, which is an ancient monument with protection zones,
- CH-15LK-E, Petropigi, where a Byzantine castle with a protection zone and outpost of Via Egnatia which is dated at the Post-Byzantine period (13th-14th century and a phase of 15th century) is located
- CH-2L17th-E, Hill of Stavros or Derveni, AntiPhilippoi, where a settlement of the Classical-Hellenistic Period and remnants of a fortress are identified and dated at Classical-Hellenistic Period (included in the Archaeological Site of Mount Paggaio) .

- CH-11a-E, Toumpa Perni, where a settlement of the Prehistoric and Historic Times and a cemetery of the Post-Roman and Byzantine Period, have been discovered during the construction activities of the existing natural gas pipeline in 2000.
- CH-3L17th-E, AntiPhilippoi 3, where pottery of the Roman and Post-Roman Period is recorded.
- CH-13a-E, Nea Komi 2, ancient town of the Roman Period (Officially recognized archaeological area)

An inventory of the Cultural Heritage Sites, including Archaeological sites, Areas of High Archaeological Potentialand Monuments, identified in the study section ofthe Regional Entity of Kavala is presented in *Table 6-133*. The density of known Cultural Heritage Sites and Areas of High Archaeological Potential suggests that the section of Kavala, is an area of high archaeological potential, highlighted as an archaeologically particularly sensitive area. Further undiscovered, underground archaeological sites and antiquities are likely to be present within this section of the base case corridor.

Table 6-133 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Kavala Regional Entity.

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Kavala									
154	CH-12-E	Field Survey	Paradeisos	403	A	Ceramic scatters in low density at the perimeter of the hill. Officially recognized archaeological site.	Prehistoric and Newer	Y	H
154	CH-12a-E	17th EPCA	Paradeisos - Kilisi Tepe	17	A	Prehistoric settlement.	Prehistoric	Y	H
154	CH-18L17th-E	17th EPCA	Dialekto - Eklekto	525	A	Settlement extended within the location 'Aeroporio' and settlement of the Roman period at the areas 'Pigadi' and 'TwoBridges'	Archaic, Classical, Roman	Y	H
158	CH-17L17th-E	17th EPCA	Lithochori	427	A	Settlement of the Prehistoric and Historic Times. Building and two cemetaries	Prehistoric and Historic	Y	H
159	CH-16L17th-E	17th EPCA	Palios Xerias	>1,000	A	Architectural remnants and remnants of a potential small road of Via Egnatia	Roman, Byzantine	Y	H
163	CH-15L17th-E	17th EPCA	Pondiada	>1,000	A	Location of the Prehistoric and Historic Times at a low hill, and marble architectural parts near agricultural field	Prehistoric and Historic	Y	H
168	CH-11-E	Field Survey	Toumpa	673	A	The site of Toumpa was approached approximately since the exact location was not known. Agricultural area with ceramic scatters in low density. Its connection to the officially recognized archaeological area of Toumpa demands further investigation.	Uncertain	Y	H
168	CH-11a-E	17th EPCA	Toumpa Perni	55	A	Settelement of the Prehistoric and Historic Times and cemetary of the Post-Roman and Byzantine Period, discovered during the construction activities of the natural gas pipeline at 2000.	Various	Y	H
168	CH-5L17th-E	17th EPCA	Petropigi - Kagia Bounar	>1,000	A	1. Surface findings of the Roman Period at the location Kagia Bounar. 2. SW of the Roman location Kagia Bounar a settlement/ fortress. 3. Two metallourgical arcades.	Roman. Classical, Hellenistic	Y	H
170	CH-15LK-E	Greek Ministry of Culture	Petropigi	640	M	Byzantine castle with a protection zone. Outpost of Via Egnatia which is dated at the Post-Byzantine period. Officiallly recognized archaeological area.	13th-14th century and a phase of 15th century	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
171	CH-10a-E	17th EPCA	Pondolivado 2	3	A	Wall, settlement and findings of the Classical and Hellenistic Period(Ancient Pistiros).	Classical,Hellenistic	Y	H
172	CH-10-E	Field Survey	Pondolivado	387	A	Ongoing excavation of parts of a fortified town of the Archaic Period, according to excavator of the site. Officially recognized archaeological site. Based on the importance of the site, further underground antiquities are likely to be found at the wider area of Pondilivado.	Archaic	Y	H
176	CH-13-E	Field Survey	Nea Komi	354	AHAP	Field with ceramic scatters and roof tiles in moderate density. The connection of the CH13 site to the officially recognized archaeological site of Nea Komi, fortress of the Roman Period, should be further investigated.	Roman and Historic	Y	H
176	CH-13a-E	17th EPCA	Nea Komi 2	9	A	Ancient town. Officially recognized archaeological area.	Roman	Y	H
178	CH-14-E	Field Survey	Akontisma, Nea Karvali	342	A	Architectural remnants of an ancient fortified town, located on a hill. Ceramic scatters in high density. Officially recognized archaeological site.	Antiquity. 4th century BC with several structural interventions, among which a recognizable one of the Byzantine Times.	Y	H
178	CH-4LK-E	Greek Ministry of Culture	Wall of Kavala	0	M	Ancient monument. The wall of Kavala is officially recognized with protection zones.	Byzantine, Post-Byzantine	Y	H
179	CH-6L17th-E	17th EPCA	Akontisma 4	350	A	1.Mound 1km north-east of the village, ancient Akondisma,2.hill between the village and the zone of phosphate fertilizers.3.two hills 500m north,north-west and 1km north,north-east from the ancient Akondisma	Archaic, Classical,Hellenistic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
180	CH-13L17th-E	17th EPCA	Akontisma 3	>1,000	A	Fortified coastal town, near the Phosphate Fertilizing Industry	Archaic, Hellenistic	Y	H
185	CH-12L17th-E	17th EPCA	Chalkero	352	A	Ancient ruins and walls of buildings which are attributed to a senctuary of Zeus and the ancient quarries. Further two fortresses of the first World War are known at the area. Officially recognized archaeological area.	Antiquity,Contemporary	Y	H
189	CH-20LK-E	Greek Ministry of Culture	Pirovolio-OchiroKokkinochomatos-SitzakDere	>1,000	A	Cemetery of the Hellenistic Period at the area of Pirovolio.Settlement of the Byzantine and Post-Byzantine Period at the area of Ochyro Kokkinochomatos. Two towers of the Classical-Hellenistic Period at the area of Sitzak Dere. Officially recognized Archaeological area	Classical-Hellenistic, Byzantine and Post-Byzantine	Y	H
195	CH-7L17th-E	17th EPCA	Vasilaki - Amygdaleonas 2	>1,000	A	Fortified town at the hills, station of Via Egnatia and the Byzantine village Chlebina, in the fields	Roman,Byzantine	Y	H
195	CH-8L17th-E	17th EPCA	Amygdaleonas 3	>1,000	A	A.Part of Via Egnatia(plot 269) and settlement of the Roman Period.	Roman	Y	H
195	CH-9L17th-E	17th EPCA	Amygdaleonas 4	>1,000	M	Part of a marble bridge of Egnatia.	Uncertain	Y	H
196	CH-14L17th-E	17th EPCA	Amygdaleonas 5	>1,000	A	Buildings of the hellenistic and Roman Period with metallourgy elements. Agricultural field of Odetis Petridi	Hellenistic, Roman	Y	H
198	CH-5-E	Field Survey	Vasilaki, Amygdaleonas	>1,000	AHAP	Area located in agricultural fields with ceramic scatters in low density. The area is considered of high archaeological potential, due to past discovery of antiquities there, among which a small Roman settlement is included, probably connected to Via Egnatia and Byzantine village in the fields.	Historic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
200	CH-73LK-E	Ministry of Culture	Archaeological Area of Philippoi	66	A	1. Ancient town of Philippoi, Walls, Acropolis hill,part of the location Kalamitsa at the area of ancient town Antisara,among other antiquities.The north boundary of the 2 km corridor is in proximity to the boundary of the archaeological site of Philippoi and of the suggested protection zone A of Dikili Tas. 2. Location Toumpa. Prehistoric settlement.Officially recognized archaeological site.	Prehistoric, Historic	Y	H
202	CH-6-E	Field Survey	Neo Chortokopi	>1,000	AHAP	Ridge covered by dense bushes. No artifacts were traced. According to the representative of the Ephorate, cist tombs and a grave of the Hellenistic Period had been found at the area, which is therefore considered as AHAP. At the area north-west of the old village of Chortokopi it is literately referred that a series of rock paintings had been found, as well as the ruins of a Post-Roman fortress and the ruins of a small Early Christian church.	-	Y	H
205	CH-4-E	Field Survey	AntiPhilippoi - Stavros Area	>1,000	AHAP	Extended investigated area with ceramic scatters in low density and part of an old pavement probably of the Post-Byzantine period. The area is located in proximity to the officially recognized archaeological sites of AntiPhilippoi and StavrosMountain.	Uncertain but probably Post-Byzantine	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
205	CH-7-E	Field Survey	Sina, AntiPhilippoi	>1,000	AHAP	Low hill with ceramic scatters in high density, which indicate the potential existance of a settlement in the underground. Metalurgical slags are included in the surface findings.	Hellenistic-Roman. The discovery of a sealed handle of a vessel, during the field survey might provide the exact dating of CH7 site.	Y	H
205	CH-3L17th-E	17th EPCA	AntiPhilippoi 3	>1,000	AHAP	Pottery of the Roman, Post-Roman Period	Roman	Y	H
207	CH-2L17th-E	17th EPCA	Hill of Stavros or Derveni, AntiPhilippoi	>1,000	A	Settlement of the Classical-Hellenistic Period and remnants of fortress.	Classical-Hellenistic	Y	H
207	CH-4L17th-E	17th EPCA	Akmaria	>1,000	A	Pottery of the Roman and later Periods.	Roman	Y	H
210	CH-9-E	Field Survey	Ekklisoudes, Paleochori	>1,000	AHAP	Three low hills in proximity one to the other. Pottery scatters, mainly domestic, were identified in high density. The findings indicate the potential existance of an underground settlement, probably, of Roman Period.	Roman	Y	H
210	CH-76LK-E	Ministry of Culture	Paggaio	>1,000 See Note 1	A	Mount of Paggaio.The whole mountain is officially recognized archaeological and historical site.	Prehistoric until Post-Byzantine	Y	H
213	CH-8-E	Field Survey	Tomb of Nikisiani	>1,000	A	Tomb of medium size covered by dense bushes. No artifacts were traced at the perimeter of the tomb. Burial tomb of the Early Hellenistic period. The tomb had been excavated in the past. Archaeological site indicated by the competent authority	Early Hellenistic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Notes									
	Site Types								
	A	Arcaheological Site							
	AHAP	Area of High Archaeological Potential							
	ICH	Site with Intagible Cultural Heritage							
	M	Monument							
	Site Importance								
	H	High							
	M	Moderate/Medium							
	L	Low							
	Cultural Heritage Site Number								
	CH	Cultutal Heritage							
	LK	Listed in the official Catalogues of Kavala Prefecture							
	L17th	Listed in the 17th EPCA official reply							
	Note 1	The official archaeological site of Paggaio includes various protection zones none of which are crossed by the project.							

Source: ASPROFOS (2013)

Of the sites inventoried in the Regional Entity of Kavala section of the base case study area, six (6) cultural heritage sites were identified within 50 m of the Project footprint, and could be subject to impacts from Project activities. These sites are: the prehistoric settlement of Paradeisos – Killisi Tepe (CH-12a-E), the Wall of Kavala (CH-4LK-E), findings near Ancient Pistiros (CH-10a-E), Perni's Toumpa (CH-11a-E), pottery scatters (CH-3L17th-E) and remnants of ancient town (CH-13a-E). All of the sites are of high importance.

6.5.3.2.5 Regional Entity of Serres (KP 222 - 302)

A total of 33 cultural heritage sites were identified within Serres Regional Entity Section (from KP 222 to KP 302, approximately); 16 within the 2 km wide corridor and 17 more outside the 2 km corridor[202]. Field survey was performed in 2 of these sites providing updated information. Cultural heritage sites vary in their type, size, informational value and quality. 23 archaeological sites, five (5) AHAP, three (3) monuments and two (2) sites with both archaeological and monumental value were identified. The majority of the identified CH sites in this region are Archaeological sites but almost all of them (32) are of high importance; one (1) is of moderate importance.

Areas of High Archaeological Potential and Newer Monuments were also identified. Among the CH sites investigated, the prehistoric settlements located at the areas of Pentapoli, Aggista and Dimitra are considered to be of substantial informational, cultural value. Of equal, substantial, informational and cultural value in the wider region of Serres, is the *Alistratis' cave* with Quaternary sediments of approximately 2.000.000 years ago. Two more caves are located in the region of Serres, the *Orpheus and the Waterfalls cave*, with Prehistoric elements.

The discovery of numerous prehistoric settlements at the wider area of the Serres Regional Entity and the scientific research at the basin of Serres, indicate that in the distant past, settlements had been developed not only on the plain, but also at the hillsides of the mountainous terrain that frame the valley of Strymonas. Therefore the wider area is likely to produce further archaeological evidence through the potential existence of unknown subsurface antiquities. At the Regional Entity of Serres the number of the existing churches is also remarkable, dating

[202]It should be noted that in this section a significant modification of the initial basecase compared to the final basecase took place and this is why so many cultural heritage sites are outside the 2 km corridor.

mainly at 18th-19th century. The density of these monuments reflects their importance in the preservation of religion, traditions and culture within the wider area.
Cultural Heritage sites in this section are varied and mainly include

- Archaeological sites of the Prehistoric Period, the Classical Period, and the Byzantine Times.
- Ceramic scatters of thePrehistoric Period and Historic Times.
- Ancient Settlements and Cemeteries.
- Burial monuments - Macedonian tombs
- Newer Monuments, including water mills and water systems

Notable CH sites in the region are also the Areas of High Archaeological Potential that were investigated during the Field Survey related to known cultural heritage sites.Within the study area at the Regional Entity of Serres, several CH sites were identified. Among the CH sites, CH-3-E investigated during the Field Survey, is lying within the 50 m zone of the base case route of the pipeline and will be subject to impacts from Project activities. CH-3-E, in the area of Peristergias, is probably connected to the officially recognized archaeological site of Peristergias. It is located on a ridge/ mound of irregular shape with ceramic scatters in low density but probably connected to the officially recognized archaeological site of ‘Alonia/ Peristerias’. Furthermore, CH-19LS-E site, ‘Athanato Nero, Rachovouna’, where cemeteries of the Classical Period and the Hellenistic Times are identified, is close to the centerline of the route and could be directly subject to impacts from project activities. The ‘Hill of Toumpa’ at Nea Zichni, CH-23LS-E, where a prehistoric settlement is known, is also included in the CH sites that are lying within the 50 m zone of the base case route of the pipeline and could be subject to impacts from Project activities.

An inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Serres Regional Entity is presented below in *Table 6-134.* The density of known Cultural Heritage Sites and Areas of High Archaeological Potential suggests that the section of Serres is an area of high archaeological potential. Further undiscovered, underground archaeological sites are likely to be present within this section of the base case corridor.

Table 6-134 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Serres Regional Entity.

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Serres									
222	CH-1L27th-E	27th EPCA	Portes	1,000	A	Graves of the Hellenistic Period.	Hellenistic	Y	H
232	CH-34LS-E	Greek Ministry of Culture	Krinida	>1,000	M	Old Primary school.Officially recognized monument.	Newer	Y	H
233	CH-50LS-E	Greek Ministry of Culture	Hill of Paleo-kastra, Nea Zichni, Rail-way Station of Aggista	>1,000	A	Prehistoric settlement and extensive ancient town. Officially recognized archaeological area	Prehistoric	Y	H
233	CH-1L12th-E	12th EBA	Agrepavlis	>1,000	A	Settlement of various periods. Officially recognized archaeological area	Byzantine	Y	H
234	CH-52LS-E	Greek Ministry of Culture	Hill at the area of Aggista Station	>1,000	A/M	Macedonia tomb and pre-existing settlement of the Bronze Age. 300m south-west potential existence of graves. Officially recognized archaeological area.	Prehistoric and Hellenistic	Y	H
234	CH-33LS-E	Greek Ministry of Culture	Aggisti	>1,000	M	Water system at the area of Aggisti. Officiallly recognized monument	Newer Monument	Y	H
236	CH-49LS-E	Greek Ministry of Culture	Elafi, Railway Station of Aggista	>1,000	A	Prehistoric settlement at the area of Aggista. Officially recognized archaeological area	Prehistoric	Y	H
237	CH-3L27th-E	27th EPCA	Toumpa Mandilion	531	A	Location of the Late Bronze Age and ceramic of the Historic Years, in the fields south of the Toumpa.	Bronze Age	Y	H
238	CH-22LS-E	Greek Ministry of Culture	Dimitra, Nea Zichni	>1,000	A	Prehistoric Settlement, officially recongized archaeological area	Prehistoric	Y	H
240	CH-19LS-E	Greek Ministry of Culture	Athanatonero, Rachovouna at the area of Mesorachi	2	A	Cemetaries of the Classical Period and the Hellenistic Times. Officially recognized archaeological area.	Classical and Hellenistic Times	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
241	CH-18LS-E	Greek Ministry of Culture	Hill of Agios Georgios at the area of Mesorachi	608	A	Prehistoric settlement and ancient cemetary. Officially recognized archaeological areas.	Prehistoric	Y	H
242	CH-5L27th-E	27th EPCA	Serres V1	180	AHAP	Cemetery of Historic Period.	Historic	Y	H
243	CH-6L27th-E	27th EPCA	Serres V3	86	AHAP	Deposits	Uncertain	Y	H
243	CH-4L27th-E	27th EPCA	Serres V2	230	AHAP	Cemetery of the Hellenistic Period.	Hellenistic	Y	H
244	CH-23LS-E	Greek Ministry of Culture	Hill of Toumpa, Nea Zichni	0	A	Prehistoric settlement. Officially recognized archaeological area	Prehistoric	Y	H
247	CH-7L27th-E	27th EPCA	Somatos Rema	739	A	Settlement of the Post-Roman Period, probably farmhouse;	Roman	Y	H
247	CH-16LS-E	Greek Ministry of Culture	Milos, Gazoros	944	M	Watermill at the old highway of Serres - Drama. Officially recognized monument	Newer Monument	Y	M
247	CH-17LS-E	Greek Ministry of Culture	Tholos	668	A	Rural settlement of the Post-Roman Period. Officially recognized Archaeological area, located between Tholos and Nea Zichni.	Post Roman	Y	H
249	CH-14LS-E	Greek Ministry of Culture	Agios Athanasios, Gazoros	>1,000	A	Officially recognized archaeological site	Prehistoric	Y	H
252	CH-15LS-E	Greek Ministry of Culture	Valtouda, Gazoros	>1,000	A	Prehistoric Settlement, officially recongized archaeological area	Prehistoric	Y	H
253	CH-1LS-E	Greek Ministry of Culture	Dafnoudi	>1,000	A	Prehistoric settlement. Officially recognized archaeological area	Prehistoric	Y	H
256	CH-6LS-E	Greek Ministry of Culture	Toumpa	116	A	Neolithic settlement, officially recognized archaeological area	Prehistoric	Y	H
258	CH-2LS-E	Greek Ministry of Culture	Alonia, Pentapoli	>1,000	A	Cemetary of the Post-Roman period with Prehistoric and Hellenistic findings officially recognized archaeological area	Prehistoric, Hellenistic and Roman	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
258	CH-4LS-E	Greek Ministry of Culture	Dexameni, Pentapoli	>1,000	A	Prehistoric Settlement, officially recongized archaeological area	Prehistoric	Y	H
258	CH-42LS-E	Greek Ministry of Culture	AgioPneyma	>1,000	A/M	1. Prehistoric settlement and remnants of walls, north-west of the village at the cross of Stavros (Hill of Gradiskos).2.Prehistoric settlement at the hill of the Primary School.3.The old Primary School(Monument).Officially recognized archaeological area.	Prehistoric, Newer	Y	H
259	CH-8L27th-E	27th EPCA	Peristerias	258	A	Cemetery of the Post-Roman Period-Officially recognized archaeological site.	Roman	Y	H
259	CH-3-E	Field Survey	Peristerias	0	AHAP	Area located on a ridge/ mound of irregular shape with ceramic scatters in low density but probably connected to the officically recognized archaeological site of Alonia/ Peristerias	Uncertain but probably Roman	Y	H
262	CH-56LS-E	Greek Ministry of Culture	Chriso-Fakistra	>1,000	A	Prehistoric settlement. Officially recognized archaeological area	Prehistoric	Y	H
265	CH-10LS-E	Greek Ministry of Culture	Neos Skopos	>1,000	A	Prehistoric settlement with findings of Classical, Roman and Byzantine Times. Officially recognized archaeological area	Classical, Roman, Byzantine	N	H
288	CH-9L27th-E	27th EPCA	Nosokomia 8	>1,000	A	Graves of the Roman Period	Roman	Y	H
288	CH-2-E	Field Survey	Nosokomia 2, between Triada - Zevgolatio area	>1,000	AHAP	Agricultural area with ceramic scatters in high density	Uncertain but probably Neolithic and Historic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
293	CH-53LS-E	Greek Ministry of Culture	Achladohori	995	A	Remnants of a town of the Roman Period and a cemetary, 6km north-east of the village.Officially recognized archaeological area.	Roman	Y	H
295	CH-55LS-E	Greek Ministry of Culture	Kalokastro	351	A	Location 'Assar'. Remnants of a Byzantine Wall and findings of the Classical, Hellenistic and Roman Period. Officially recognized archaeological area.	Byzantine, Classical,Hellenistic,Roman	Y	H

Notes

	Site Types	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument
	Site Importance	
	H	High
	M	Moderate/Medium
	L	Low
	Cultural Heritage Site Number	
	CH	Cultutal Heritage
	LS	Listed in the official Catalogues of Serres Prefecture
	L27th	Listed in the 27th EPCA official reply
	L12th	Listed in the 12th EBA official records

Source: ASPROFOS (2013)

Of the sites inventoried in the Regional Entity of Serres section of the base case study area, three (3) cultural heritage sites were identified within 50 m of the Project footprint, and could be subject to impacts from Project activities. These sites are: ceramic scatters (CH-3-E), cemetaries (CH-19LS-E) and a prehistoric settlement near Nea Zichni (CH-23LS-E). All of the sites are of high importance.

6.5.3.2.6 Regional Entity of Thessaloniki (KP 302 - 359)

A total of 33 cultural heritage sites were identified within Thessaloniki Regional Entity section (from KP 302 to KP 359, approximately); 21 within the 2 km corridor and 12 more ouside the 2 km corridor. Cultural heritage sites vary in type, size, importance and informational value.18 archaeological sites, nine (9) AHAP, five (5) monuments and one (1) ICH, were identified in all. Monuments include mainly churches. 28 of the cultural heritage sites were deemed of high importance, one (1) of moderate and four (4) of low importance. Field survey was performed in 13 of these sites providing updated information.

Site types along this section include

- Ceramic and tile scatters of Prehistoric Period, Classical Period, Byzantine and Post-Byzantine Times, Newer and Contemporary.
- Archaeological sites of the Prehistoric Period, the Classical Period, and the Byzantine Times.
- Prehistoric Tubas/Tombs.
- Burial monuments and cemetery.
- Newer Monuments.
- Movable Cultural Heritage, housed in Museums, Churches and Cultural Associations, related to (local) tradition and culture.

The most notable sites from this region include the known archaeological site of ‘Assiros’ Toumpa’ (CH-4LT-E). Archaeological sites of ‘Agia Anna’ (CH-1LT-E) and ‘Koutsolitis’ (CH-2LT-E) are also important for the cultural context of the area. However, they do not seem to be affected by the project, since they are not within the 2 km corridor. Assiros village is

considered an important cultural area, mainly due to the density of the existing CH sites in the area.

During the Field Surveys three (3) more areas were investigated, at the three (3) formerly potential locations of GCS01. The areas were flatlands, with ceramic scatters and roof tiles in low density, probably Newer and Contemporary. These are the areas ‘Thessaloniki 1’ (CH-37-E), ‘Thessaloniki 2’ (CH-38-E) and ‘Thessaloniki 3’ (CH-39-E). These areas cross the main route of the 2km corridor, but they did not provide visible evidence of archaeological interest or informational value during the Field Survey of November 2012.

The areas near Dorkada, where a Prehistoric tuba is located (CH-40-E) and the areas ‘Vlachika Kalivia 1’ and ‘Vlachika Kalivia ‘2, with ceramic scatters in low density (CH-43-E and CH-44-E, respectively), near the village Melissochori-Karteres, were also investigated. The CH site of Dorkada is of interest, as it has not been excavated, investigated or officially recorded so far; it has already suffered substantial damage in parts of the tomb due to illegal activities.

Assiros has provided substantial archaeological information about the cultural context of the area, mainly through the systematic excavation and research, in the past, of the archaeological site ‘Toumpa’ of the Bronze and Iron Age. A settlement with architectural remains, storage rooms and a road, used during the Late Bronze Age and the Early Iron Age, were identified. The architectural characteristics of the site of ‘Toumpa’ appear in accordance with the architectural style of the Bronze Age, where settlements are characterized by a clear ordinance. The discovery of several storage rooms, with a variety of crops identified in big storage jars, for food preparation at the Toumpa, is strictly confined within the limits of these rooms. The capacity of the rooms was large enough for long-term food needs. Such characteristics indicate the self-sufficiency of the settlement. As in the preceding periods, life in the Bronze Age depends on a mixed economy with the appearance of new crops, such as millet. Millet was an important dietary element for the population of AxiosValley, as well as for the areas of LakesLagadas and Volvi (Assiros), where a variety of cereals and legumes was discovered (Toumpa Assiros). Therefore, Toumpa of Assiros has provided vital information for the dietary and the economy of the Bronze Age, among other useful archaeological data.

In addition remarkable CH sites were identified at the area of Pentalofos. The area of Pentalofos,CH-31LT-E is an officially recognized archaeological site with protection zones and includes: a PrehistoricSettlement, located on atuba, at distance of 2 km North-West of

Pentalofos, a Burial Tomb at a distance of 1 km West of Pentalofos and a Settlement-tuba ('Sousamomylos') at a distance of 1.5 km South- South West of Pentalofos. The archaeological area of Pentalofos (CH-31LT-E) is not within the 50 m footprint of the project, but is considered of vital importance.

An inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Thessaloniki Regional Entity is presented below in *Table 6-135*. The density of known Cultural Heritage Sites and Areas of High Archaeological Potential suggests that the study section of Thessaloniki is an area of moderate to high archaeological potential. Further undiscovered, underground archaeological sites are likely to be present within this section of the base case corridor.

Table 6-135 Inventory of the Cultural Heritage Sites and Areas of High Archaeological Potential identified in the section of Thessaloniki Regional Entity.

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Regional Entity of Thessaloniki									
309	CH-8LT-E	Greek Ministry of Culture	Lachanas Paliokastro Location	198	A	Parts of Fortification Walls and arch of a Church, among other antiquities. Officially recognized archaeological area with a protection zone of 100m. around the hill.	Iron Age until Byzantine Period.	Y	H
319	CH-44-E	Field Survey	Vlachika Kalivia 2	200	AHAP	Area located in fields with no ceramic statters or other artifacts traced	-	N	L
319	CH-12aL16th-E	16th EPCA	Karteres -Vlachika Kalivia 1	184	A	Settlement of the Roman Period	Roman	Y	H
319	CH-12bL16th-E	16th EPCA	Karteres-Vlachika Kalivia 2	310	A	Settlement of the Roman Period	Roman	Y	H
320	CH-43-E	Field Survey	Vlachika Kalivia 1	260	AHAP	Agricultural area with ceramic scatters in low density	Unknown but probably Historic	N	M
321	CH-9LT-E	Greek Ministry of Culture	Lefkochori	>1,000	A	Settlement on a hill at the location Agios Georgios of Lefkochori. Officially recognized archaeological area.	Bronze Age, Iron Age	Y	H
327	CH-40-E	Field Survey	Dorkada 1	412	A	Tomb with high density of ceramic scatters, partly distroyed	Prehistoric	N	H
329	CH-5LT-E	Greek Ministry of Culture	Examili - Sasakarou Baira	>1,000	A	Officially recognized archaeological site with coordinates. Settlement on a tuba on a hill	Late Bronze Age until Historic Times	Y	H
330	CH-3L9th-E	9th EBA	Examili 3	>1,000	A	Archaeological site of the Byzantine times near the village.	Byzantine	Y	H
330	CH-6LT-E	Greek Ministry of Culture	Krithia, Marikou Tapsi or Mpachtses	>1,000	A	Officially recognized archaeological site with coordinates. Settlement-tuba of the Late Bronze Age and settlement of the Historic Times	Late Bronze Age - Historic Times	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
332	CH-2LT-E	Greek Ministry of Culture	Koutsolitis Assiros B	>1,000	A	Officially recognized archaeological site with coordinates at Assiros. Tomb on a natural fortified hilll	Early Iron Age	Y	H
333	CH-3LT-E	Greek Ministry of Culture	Toumpa Lakkou Assiros E	>1,000	A	Officially recognized archaeological site with coordinates at Assiros. Settlement on a tuba	Late Bronze Age - Early Iron Age	Y	H
334	CH-1a-E	Field Survey	Assiros 1	>1,000	M	Church of the Prophet Elias at the village of Assiros	Unknown but newer	Y	H
334	CH-1b-E	Field Survey	Assiros 1	>1,000	M	Cemetary near by the church of Prophet Elias	Unknown but newer	Y	H
334	CH-200-E	Field Survey	Assiros Village	>1,000	ICH	Site with Intangible Cultural Heritage to the local construction of a traditional wagon, known as ‘karo’. The production of this kind of wagon is attributed to a resident of the village of Assiros, who is considered to be one of the few remainning preserving such a traditional occupation.	Contemporary	Y	H
335	CH-1LT-E	Greek Ministry of Culture	Agia Anna	>1,000	A	Officially recognized archaeological site with coordinates at Assiros. Settlement on a bank	Neolithic, Late Bronze Age, Early Iron Age, Roman, Old Christian	Y	H
335	CH-41-E	Field Survey	Assiros 2	680	AHAP	Agricultural area near the tomb of the military camp of Assiros with pottery scatters in medium density	Roman	Y	H
335	CH-42-E	Field Survey	Assiros 3	1,000	AHAP	Agricultural area with high density of mainly domestic pottery scatters, textile weight and a metal ring among surface findings	Post-Byzantine probably	Y	H
335	CH-9L16th-E	16th EPCA	Assiros - Paleochora	703	AHAP	Neolithic settlement	Neolithic	Y	H

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
335	CH-45-E	Field Survey	Assiros 4	676	AHAP	Ceramic scatters in high density and a fountain with structural elements of other periods.	Probably Byzantine	Y	H
336	CH-4LT-E	Greek Ministry of Culture	Toumpa, Assiros A	440	A	Officially recognized archaeological site with coordinates at Assiros. Settlement on a tuba	Late Bronze Age - Early Iron Age	Y	H
342	CH-716th-E	IST'EPCA	Drymos, Assiros C	487	A	Prehistoric settlement on a bank. Toumpa Drymou.Officially recognized archaeological site.	Prehistoric	Y	H
344	CH-7L9th-E	9th EBA	Temple of Agios Nikolaos	678	M	Church of Saint Nicolas.Area of Kamara.	Uncertain	Y	H
346	CH-5L16th-E	Greek Ministry of Culture	Toumpa of Tserempek, Melissochori	343	A	Toumpa-Prehistoric settlement.Officially recognized archaeological area.	Prehistoric	Y	H
348	CH-46-E	Field Survey	Castle of Oreokastro	>1,000	A	Architectural remnants.	Uncertain	Y	H
349	CH-5L9th-E	9th EBA	Agrepavlis	640	A	Rural villa of the Early Christian Times, in the settlement of Paliokastro.	Early Christian	Y	H
349	CH-40LT-E	Greek Ministry of Culture	Paleokastro, Oreokastro	290	M	Officially recognized Monuments. Group of 4 mills.	Byzantine, Post-Byzantine	Y	H
350	CH-6L9th-E	9th EBA	Temple of Agios Athanasios	615	M	Church of Saint Athanasios.	Uncertain	Y	H
354	CH-31LT-E	Greek Ministry of Culture	Archaeological area of Pentalofos near Oreokastro	40	A	Officially recognized archaeological site with protection zones and coordinates: 1. Settlement-tuba and bank, 2. Burial tomb, 3. Settlement-tuba on a bank.	Bronze Age, Iron Age, Archaic Period, Classical Period and Historic Times	Y	H
356	CH-38-E	Field Survey	Thessaloniki 2	50	AHAP	Flat areas of land with ceramic scatters and roof tiles in low density	Newer and probably Contemporary	Y	L

km Point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
356	CH-39-E	Field Survey	Thessaloniki 3	55	AHAP	Flat areas of land with ceramic scatters and roof tiles in low density	Newer and probably Contemporary	Y	L
357	CH-37-E	Field Survey	Thessaloniki 1	160	AHAP	Flat areas of land with ceramic scatters and roof tiles in low density	Newer and probably Contemporary	Y	L
357	CH-1L16th-E	Greek Ministry of Culture	Panagia, Nea Ionia.	>1,000	A	Settlement of the Historic Years on a bank. Officially recognized archaeological site.	Historic	Y	H

Notes	**Site Types**	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument
	Site Importance	
	H	High
	M	Moderate/Medium
	L	Low
	Cultural Heritage Site Number	
	CH	Cultutal Heritage
	LT	Listed in the official Catalogues of Thessaloniki Regional Entity
	L16th	Listed in the 16th EPCA official reply
	L9th	Listed in the 9th EBA official reply

Source: ASPROFOS (2013)

Of the sites inventoried in the Regional Entity of Thessaloniki section of the base case study area, three (3) cultural heritage sites were identified within 50 m of the Project footprint, and could be subject to impacts from Project activities. These sites are: ceramic scatters (CH-38-E and CH-39-E) and the archaeological site of Pentalofos (CH-31LT-E). CH-38-E and CH-39-E are of low importance, whilst CH-31LT-E is of high importance.

6.5.3.2.7 Axios Plain Section (KP 359 - 425)

A total of 24 cultural heritage sites were identified within the 2 km wide corridor in the Axios Plain section. The sites vary in their size, type and importance. Archaeological sites predominated in the Axios Plain, with 21 archaeological sites and 3 monuments. Of the 24 sites identified, 7 are of low importance and/or quality, 6 are of moderate importance and/or quality, and 11 are of high importance and/or quality. Site types along this section include:

- Ceramic and tile scatters (Late Neolithic, Iron Age, Classic, Hellenistic, Roman, Early Christian, Byzantine);
- Officially recognized archaeological sites (Late Neolithic, Iron Age, Hellenistic, Roman, Late Roman, Ottoman period);
- An ancient cemetery;
- Monuments (19th century churches); and,
- Architectural remains (Ottoman period).

The most notable sites from this region include: the Iron Age site of Vathilakos (CH-235), the prehistoric settlement of Partheni (CH-232), the capitol of ancient Macedonia at Pella (CH-226), the Church of Aghios Ioannis Prodromos (CH-71) in Liparon, the ancient cemetery of Polla Nera (CH-231), and the Prehistoric and Roman settlement of Petria (CH-230).

It is well known that Pella (CH-226) was a port city in antiquity, but it should also be noted that the Greek Ministry of Culture LPD currently recorded boundary for Pella might not accurately reflect the actual extents of the ancient city. Dense scatters of Hellenistic, Roman and Byzantine ceramics were uncovered during the field survey directly to the south of the official boundary for Pella suggesting that this portion of land was likely not covered by water during the Classical and

Byzantine periods. Even if this area was underwater during the Classical period, there is potential for discovering shipwrecks and other nautical cultural heritage artifacts.

In addition to the cultural heritage sites, 16 areas of high archaeological potential were identified within the Axios Plain section of the base case route. These include 15 areas adjacent to confirmed sites and 1 independently recorded area, not associated with a cultural heritage site.

An inventory of the cultural heritage sites identified in the Axios Plain is presented below in *Table* **6-136**. The density of reported archaeological sites and areas of high archaeological potential suggests that the Axios Plain is a section of moderate to high archaeological potential. A number of additional undiscovered sites and archaeological resources are likely to be present within this section of the base case corridor. Cultural heritage sites and areas of high archaeological potential identified in the Axios Plain are mapped in *Annex 4.7*.

Table 6-136 Inventory of Cultural Heritage Sites and Areas of High Archaeological Potential in the Axios Plain Section Study Area

km point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Axios Plain									
365.9	CH-46	Ground-truthed in Nov. 2010 and Feb. 2011	Gefira 6	660	A	Potential site at Gefira. Hilly terrain on the road from Gefira to Vathilakos;	Uncertain	Y	H
366.1	CH-1	Ground-truthed in Oct. 2011	-	13	A	Low density ceramic scatter of at least 0.2 ha including a large sherd of post-Roman 6th century AD date. Site sits atop a low hill in a flat agricultural plain, which is an ideal place for ancient settlement;	Post-Roman	Y	L
367.0	CH-235	Greek Ministry of Culture LPD	Vathilakos 5	943	A	Designated site, possibly dates to the early Iron Age with continued occupation into historical times in the Toumba and Trapeza areas;	early Iron Age, Historic	Y	H
373.8	CH-224	Greek Ministry of Culture LPD	Valtochori	853	A	Oikismos Sougoular, from the era of Ottoman rule;	Ottoman	Unknown	H
376.0	CH-232	Greek Ministry of Culture LPD	Partheni 1	788	A	Mound of Partheni or Valtochori. Prehistoric settlement. Designated site. Protection zone is defined 300 m around the mound. The occupation of the site continued into historical times;	Late Neolithic, Historic	Y	H
376.3	CH-52	Ground-truthed in Nov. 2010 and Feb. 2011	Nea Chalkidona 3	850	A, M	Mound between Partheni and Chalkidon;	Possibly LN	N	H
384.8	CH-3	Ground-truthed in Oct. 2011	-	283	A	Dense ceramic scatter measuring at least 50 m in diameter, including Classical, Hellenistic, Roman, Early Christian and Byzantine sherds. Site located in a freshly ploughed field;	Classical, Hellenistic, Roman, Early Christian, Byzantine	Y	L

km point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
385.0	CH-226	Greek Ministry of Culture LPD	Pella	803	A	Designated archaeological site of Pella includes periods of Neolithic, Bronze and Iron Age habitation, the Hellenistic city of Pella, the Roman colony, and the Late Roman settlement of Pella;	Neolithic, Bronze Age, Iron Age, Hellenistic, Roman, Late Roman	Y	H
385.2	CH-4	Ground-truthed in Oct. 2011	-	95	A	Low density ceramic scatter with a diameter measuring at least 70 m, including sherds of possible Classic or Hellenistic date. Site located in a cotton field;	Greek Classical, Hellenistic	Y	L
385.5	CH-5	Ground-truthed in Oct. 2011	-	59	A	Low density ceramic scatter of undecorated sherds. Site located in a cotton;	Uncertain, but Pre-Modern	N	L
404.0	CH-206	Greek Ministry of Culture LPD	Aghios Loukas 1	986	M	Church of Aghios Petros and Pavlos (19th century) in the village of Aghios Loukas;	19th century	Unknown	H
408.4	CH-71	Ground-truthed in Feb. 2011	Liparon 1	955	M	Church of Aghios Ioannis Prodromos, a small 3-aisled basilica. Mural paintings by Siatista painters group and icons dating from the 19th century. The area is mentioned in historic sources in 1357 and in 1481. Archaeological research revealed a possible earlier, Byzantine phase of the monument or a Byzantine monument close to the present day church. Listed monument;	late 18th century, renovated in the late 19th century	Y	H
417.5 – 418.0	CH-230	Greek Ministry of Culture LPD	Petria 1	68	A	Officially recognized site of Petria, a Prehistoric and Roman settlement;	Prehistoric, Roman	Y	H

km point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
417.5	CH-6	Ground-truthed in Oct. 2011	-	106	A	Low density ceramic scatter of at least 0.2 ha, including Roman style sherds dating to the 4th-5th centuries AD. The site is located in an apple orchard and is likely part of the larger known site of ancient Petria;	Roman	Y	M
417.9	CH-7	Ground-truthed in Oct. 2011	-	211	A	Dense ceramic scatter of at least 0.5 ha including Roman style sherds. Site was identified by the director of the Pella Museum. The site is located in a freshly ploughed wheat field and was also identified in an adjacent fig grove to the South. This site is likely part of the larger known site of ancient Petria;	Roman	Y	M
418.0	CH-8	Ground-truthed in Oct. 2011	-	116	A	Low density ceramic scatter measuring at least 70 m in diameter, including roof tiles and undecorated sherds. Site located in an agricultural field within the boundaries of the Prehistoric and Roman site of Petria as defined by the Ministry of Culture;	Uncertain, but Pre-Modern	N	L
418.7	CH-9	Ground-truthed in Oct. 2011	-	41	A	Low density ceramic scatter including one undecorated cylindrical handle. Site located in a tree plantation with low grass;	Uncertain, but Pre-Modern	N	L
419.4	CH-10	Ground-truthed in Oct. 2011	-	33	A	Medium density ceramic scatter measuring ca 44 m in diameter, consisting mainly of roof tile fragments. Site located in a tree plantation with low grass;	Uncertain, but Pre-Modern	N	L

km point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
420.3	CH-11	Ground-truthed in Oct. 2011	-	138	A	Dense ceramic scatter with a diameter measuring at least 29 m, including glazed and typical incised Post-Byzantine pottery and a quantity of roof tiles. Site located in a freshly ploughed wheat field;	Post-Byzantine	N	M
420.5	CH-12	Ground-truthed in Oct. 2011	-	77	A	Dense ceramic scatter with a diameter measuring at least 71 m, including Post-Byzantine pottery and roof tiles. Site located in a freshly ploughed wheat field;	Post-Byzantine	Y	M
420.6	CH-72	Ground-truthed in Nov. 2010 and Feb. 2011	Loutrochori 1	354	M	Church of Aghios Georghios. Old church in the cemetery of the village. The church is in a poor state of preservation and the mural paintings are partially preserved. Listed Monument;	19th century	Y	H
421	CH-13	Ground-truthed in Oct. 2011	-	12	A	Ruined remains of stone architecture in the form of walls and the remains of two houses which seem to be Pre-Modern, perhaps from the Ottoman period. The site is located on top of a low hill with little vegetation cover;	Ottoman, Pre-Modern	Y	M

km point (KP)	*Cultural Heritage Site Number*	*Source of Site Information*	*Site Name*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
423.5	CH-14	Ground-truthed in Oct. 2011	-	17	A	Dense ceramic scatter with a dia-meter measuring at least 135 m, including roof tiles and sherds of possible Hellenistic date. Sites extends to a vineyard (poor visibility), a ploughed field (good visibility/centre of site) and a tree plan-tation (isolated sherds). The local guard of antiquities, Mr. Dimitroussis pointed roughly the vineyard area as the site of an excavation of a cemetery carried out in the 60's and possibly the site of a chance finding (relief fragment);	Hellenistic	Y	M
424.2	CH-231	Greek Ministry of Culture LPD	Polla Nera 1	50	A	Polla Nera ancient cemetery in the Paliambela area.	Uncertain	Y	H

Notes		
	Site Types	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument
	Site Importance	
	H	High
	M	Moderate/Medium
	L	Low
	Cultural Heritage Site Number	
	CH	Cultutal Heritage

Source: ERM (2012)

Of the sites inventoried in the Axios Plain section of the base case study area, 6 cultural heritage sites were identified within approximately 50 m of the Project footprint, and will be subject to impacts from Project activities. These sites are: ceramic scatters (CH-1, CH-9, CH-10, and CH-14), stone architecture (CH-13) and the official boundaries of the protected archaeological site of Polla Nera (CH-231). Of these, the site of Polla Nera, at KP 424.2-424.8, is the most important site, since it is officially protected by the Greek government, but its location outside of the working strip decreases its exposure to potential Project impacts. The sites of most likely to be affected by Project activities are the ceramic scatters at KP 366.1 and 432.5 (CH-1 and CH-14), since they directly intersect the centreline. The stone architecture at KP 421 (CH-13) also poses a constraint to the Project, since it probably indicates further subsurface archaeological resources and it is situated very close to the base case route centreline.

6.5.3.2.8 Vermio Mountain Section (KP 425 - 466)

A total of 18 cultural heritage sites were identified within the study area in the Vermio Mountain section. The sites vary in their size, type, importance and quality. The majority of identified cultural heritage sites in the Vermio Mountain section are archaeological sites; 12 are archaeological sites, 4 are monuments, 1 is a site with ICH value and 1 is a monument with ICH value. Of the 18 sites identified, 7 are of low importance and/or quality, 1 is of moderate importance and/or quality, and 10 are of high importance and/or quality. Site types along this section are varied and include:

- Ceramic and roof tile scatters (dating from the Late Roman to Post-Byzantine periods);
- Historic and Modern monuments (church, bridge, field houses, a monastery and a contemporary monument);
- An ancient fortress;
- A Roman settlement;
- A recreational area;
- Officially protected archaeological sites (of the Neolithic, Hellenistic, Roman and Byzantine periods).

The most notable sites from this region include: the Church of Aghios Nikolaos (CH-79) in Aghia Fotini, the fortress of Kato Grammatiko (CH-210), and Kastro Bridge (CH-83) in Pirgi.

In addition, 9 areas of high archaeological potential were identified in association with cultural heritage sites within the Vermio Mountain section of the base case route.

An inventory of the cultural heritage sites identified on the Vermio Mountain slopes is presented below in *Table 6-137*. The density of reported archaeological sites and areas of high archaeological potential suggests that Vermio Mountain is a section of moderate archaeological potential.

A number of additional undiscovered sites and archaeological resources are likely to be present along the Vermio Mountain section of the base case route. Cultural heritage sites identified in the Vermio Mountain section are mapped in *Annex 4.7*.

Table 6-137 Inventory of Cultural Heritage Sites and Areas of High Archaeological Potential in the Vermio Mountain Section Study Area

km point (KP)	*CH Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Vermio Mountain									
432.0	CH-79	Aghia Fotini 1	Ground-truthed in Nov. 2010 and Feb. 2011	542	M, ICH	Church of Aghios Nikolaos, located on a small hill within the village. Contemporary monument to be executed at the foot of the hill;	Uncertain, Modern	Y	H
436.6	CH-15	-	Ground-truthed in Oct. 2011	84	A	Medium density ceramic scatter with a diameter measuring at least 15 m, consisting of a few roof tiles, non-diagnostic pottery and an undecorated cylindrical handle. Site located on a wooded slope with low grass;	Uncertain, but Pre-Modern	N	L
437.0	CH-80	Ano Grammatiko 1	Ground-truthed in Nov. 2010 and Feb. 2011	202	ICH	Recreational area in a forest clearing close to Ano Grammatiko;	Modern	Y	M
438.5	CH-204	Ano Grammatiko 2	Greek Ministry of Culture LPD	592	A	Ancient settlement. Roman pottery scatters are reported at the entrance of the village;	Roman	Y	H
440.8-441.3	CH-210	Kato Grammatiko Fortress 4	Greek Ministry of Culture LPD	300	A	Fortress in Kato Grammatiko, south of Vasilikos Hill. An officially recognized site of an ancient stone fortress with a wall of 1.5 m thick;	Uncertain	Unknown	H
443.1	CH-16	-	Ground-truthed in Oct. 2011	6	A	Medium to high density ceramic scatter with a diameter measuring at least 36 m, consisting mainly of non-diagnostic, poorly preserved sherds, a few roof tiles, and a possible Late Roman sherd. Site located in a fruit tree grove in a small valley in a mountainous area which could have favoured past human activity;	Uncertain, possibly Post-Roman	Y	L

km point (KP)	*CH Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
443.1	CH-17	-	Ground-truthed in Oct. 2011	17	A	Medium density ceramic scatter consisting of undecorated non-diagnostic sherds, roof tiles, an undecorated handle and one sherd of possible Post-Byzantine date. Site located in a fruit tree grove in a small valley in a mountainous area which could have favoured past human activity;	Post-Byzantine	Y	L
443.4	CH-18	-	Ground-truthed in Oct. 2011	3	A	Rather low density ceramic scatter consisting of a few roof tiles, a couple of Post-Byzantine sherds and a Late Roman sherd. A rather rectangular rock is visible (possibly used as a field boundary). Site located in a fruit tree grove in a small valley in a mountainous area which could have favoured past human activity;	Late Roman, Post-Byzantine	Y	L
446.0	CH-83	Pirgi 3	Ground-truthed in Nov. 2010 and Feb. 2011	689	M	Kastro Bridge. Stone bridge. The area lies on an important ancient track leading from Eordaia to the Upper Macedonia. Stone-paved pathways reported in the area are possibly part of this track. Listed monument with a surrounding protection zone of 200 m. Close to the village, in fortified settlement area dating from the Hellenistic to Byzantine periods;	Uncertain, possibly Post-Byzantine	Y	H
446.0	CH-19	-	Ground-truthed in Oct. 2011	55	A	Poorly preserved remains of stone house measuring no less than 0.01 ha. The structure is believed to be of historic date or recent antiquity. No associated ceramics were found nearby, making dating difficult;	Uncertain, probably Modern	N	L
446.1	CH-20	-	Ground-truthed in Oct. 2011	401	A	Well preserved field house made of dry stone. Perhaps a modern field house, but likely an important part of the Modern social landscape;	Uncertain, probably Pre-Modern	Y	L

km point (KP)	*CH Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
447.6	CH-84	Pirgi 2	Ground-truthed in Nov. 2010 and Feb. 2011	939	M	Sandrinos. Stone made bridge in Pirgi.	Uncertain, probably Modern	N	L
447.8	CH-345	Kominia Lofos	30th Ephorate site list, Dec 6th, 2011	322	A	Neolithic period archaeological site, indicated by the 30th Ephorate	Neolithic	Unknown	H*
448.2	CH-346	Kominia Chorafia	30th Ephorate site list, Dec 6th, 2011	471	A	Neolithic period archaeological site, indicated by the 30th Ephorate	Neolithic	Unknown	H*
450.0	CH-348	Omali Lofos	30th Ephorate site list, Dec 6th, 2011	324	A	Hellenistic period archaeological site, indicated by the 30th Ephorate	Hellenistic	Unknown	H*
450.2	CH-347	Omali Mikros	30th Ephorate site list, Dec 6th, 2011	47	A	Roman and Byzantine period archaeological site, indicated by the 30th Ephorate	Roman, Byzantine	Unknown	H*
455.4	CH- 88	-	Ground-truthed in Nov. 2010 and Feb. 2011	29	M	Church of Ayios Rafail in Maniaki;	Uncertain	Y	H
456.2	CH-89	Antigonos 3	Ground-truthed in Nov. 2010 and Feb. 2011	521	M	Monastery of Grigorios Palamas. (Coordinates not taken in situ);	Uncertain	Unknown	H

Notes

Site Types	
A	Arcaheological Site
AHAP	Area of High Archaeological Potential
ICH	Site with Intagible Cultural Heritage
M	Monument
Site Importance	
H	High
M	Moderate/Medium

km point (KP)	*CH Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
	L	Low							
	Cultural Heritage Site Number								
	CH	Cultutal Heritage							

[*] *This is one of the sites indicated in a correspondence to TAP from the 30th Ephorate. This site has not been ground-truthed to determine site conditions, thus it has not be evaluated using the importance/quality criteria described in Table 6-128. However, this site is assumed to be of high importance based on the attention drawn to it by the 30th Ephorate.*

Source: ERM (2011)

Of the sites inventoried in the Vermio Mountain section of the base case study area, 5 cultural heritage sites were identified within 50 m of the Project footprint, and are likely to be subject to impacts from Project activities (see Section 8.17). These sites are: ceramic scatters (CH-16, CH-17 and CH-18), the Church of Ayios Rafail (CH-88) and the Roman and Byzantine period site of Omali Mikros (CH-347). Of these, the site of Omali Mikros, at KP 450.2, is the most sensitive; it was pointed out by the 30th Ephorate and is assumed to be of high importance. However, it is located outside of the working strip, decreasing its exposure to potential Project impacts. The sites most likely to be affected by Project activities are the ceramic scatters at KP 443.1 and KP 443.4 (CH-16 and CH-18) since one site intersects the centreline and another site intersects both the centreline and the end of the Kato-Grammatiko access road.

6.5.3.2.9 Ptolemaida Basin Section (KP 466 - 486)

A total of 7 cultural heritage sites were identified within the 2 km-wide corridor in the Ptolemaida Basin section. The sites vary in their size, type, importance and quality. Studies identified 4 archaeological sites, 2 sites with ICH value, and 1 monument. Of the 7 sites identified, 2 are of low importance and/or quality and 5 are of high importance and/or quality. Site types along this section include:

- Ceramic scatters (Bronze Age, Classical period);
- Remains of an ancient stone threshold;
- Orthodox churches;
- A modern recreational area;
- Officially protected archaeological sites.

The most notable sites from this region include: the archaeological site at Pentavrissos (CH-228), the Church of the Assumption (CH-115) and another Church of the Assumption with a recreational area (CH-121).

In addition, 1 area of high archaeological potential was identified in association with cultural heritage sites within the Ptolemaida Basin section of the base case route.

An inventory of the cultural heritage sites identified in the Ptolemaida Basin is presented below in *Table 6-138*. The density of reported archaeological sites and areas of high archaeological potential suggests that the Ptolemaida Basin is a section of relatively low archaeological potential. The Ptolemaida Basin is the area of least archaeological sensitivity in the western project region. Nevertheless, additional undiscovered sites and/or archaeological resources may be present along this section of the baseline. Cultural heritage sites identified in the Ptolemaida Basin section are mapped in *Annex 4.7*.

Table 6-138 Inventory of Cultural Heritage Sites and Areas of High Archaeological Potential in the Ptolemaida Basin Section Study Area

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Ptolemaida Basin									
468.7	CH-228	Pentavrissos 1	Greek Ministry of Culture LPD	606	A	Officially recognized archaeological site;	Uncertain	Unknown	H
469.8	CH-349	Rachi	30th Ephorate site list, Dec 6th, 2011	215	A	Roman and Byzantine period archaeological site, indicated by the 30th Ephorate	Roman, Byzantine	Unknown	H*
470.8	CH-22	-	Ground-truthed Oct. 2011	23	A	Low density ceramic scatter. Ceramic technology suggest dating to sometime during the Classical period, but cannot yet be identified to a specific culture;	Classical	N	L
475.1	CH-115	Mouriki 1	Ground-truthed Nov. 2010 and Feb. 2011	20	ICH	Church of the Assumption;	Possibly Modern	Y	H
484.2	CH-121	Foufas 1	Ground-truthed Nov. 2010 and Feb. 2011	397	ICH	Church of the Assumption and recreational area in the churchyard, located by the road.	Possibly Modern	N	H
485.2	CH-23	-	Ground-truthed Oct. 2011	48	A	Medium density ceramic scatter. Ceramic style and technology suggests possible Bronze Age date, although further investigation should be able to more precisely date this cultural context. Ashlar stone threshold possibly belonging to a house also found nearby along road cutting;	Bronze Age	Y	L
485.8	CH-122	Variko 5 (Drosero)	Ground-truthed Nov. 2010 and Feb. 2011	192	M	Church of Aghia Kiriaki;	Uncertain	N	H

Notes	**Site Types**	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
	Site Importance								
	H	High							
	M	Moderate/Medium							
	L	Low							
	Cultural Heritage Site Number								
	CH	Cultutal Heritage							

[*] *This is one of the sites indicated in a correspondence to TAP from the 30th Ephorate. This site has not been ground-truthed to determine site conditions, thus it has not be evaluated using the importance/quality criteria described in Table 6-128. However, this site is assumed to be of high importance based on the attention drawn to it by the 30th Ephorate.*

Source: ERM (2012)

Of the sites inventoried in the Ptolemaida Basin section of the base case study area, 3 cultural heritage sites were identified within 50 m of the Project footprint, and will be subject to impacts from Project activities. These sites are: ceramic scatters (CH-22 and CH-23) and the Church of the Assumption (CH-115). The ceramic scatters at KP 470.8 and KP 485.2 (CH-22 and CH-23) are notable, as they may indicate subsurface resources which extend into the Project footprint area. The Church of the Assumption at KP 475.1 is the most sensitive site in this section and at risk for direct Project impacts, since it is a high importance site located on the edge of the Project working strip.

6.5.3.2.10 Askion Mountain Section (KP 486 - 507)

A total of 21 sites were identified within the 2 km wide corridor in the Askion Mountain section. The sites vary significantly in their size, type, importance and quality. The sites reported in the Askion Mountain section include: 12 archaeological sites, 6 monuments, 2 sites with ICH value, and 1 monument with ICH value. Of the 21 sites identified, 3 are of low importance and/or quality, 3 are of moderate importance and/or quality, and 15 are of high importance and/or quality. Site types along this section include:

- Ceramic and roof tile scatters, some of which are associated with the Korissos crop markings (Hellenistic, Roman);
- Churches and chapel (Late Byzantine, 19th century, Modern);
- Officially recognized archaeological sites (Neolithic, Bronze Age, Hellenistic through Byzantine);
- A contemporary recreational area;
- Stone-paved surfaces;
- A 19th century monastery;
- Possible ancient structures.

This region is home to many historic churches and a number of associated ceramic scatters (CH-28, CH-29, CH-30, CH-31, CH-32, CH-33, and CH-136) which are highly suggestive of the presence of further archaeological resources in the region[203].

In addition, 11 areas of high archaeological potential were identified in association with cultural heritage sites within the Askion Mountain section along the base case route.

An inventory of the cultural heritage sites identified on the Askion Mountain slopes is presented below in Table 6-139. Based on the density of reported archaeological sites and areas of high archaeological potential, this section appears to possess very high archaeological potential. There are also many high importance sites here. A high quantity of undiscovered subsurface archaeological resources is expected to exist in this section due to: 1) the high density of archaeological finds in this section, and 2) the presence of the crop markings near Korissos, which indicate the remains of an ancient settlement spanning approximately 9 km of the pipeline corridor. A visual analysis of aerial photography and infrared images identified a number of markings on the landscape which are inconsistent with current crop patterns and which are suggestive of ancient features such as the roads and walls of an ancient town. Further analysis of historic aerial photograhs indicated that at least some of the markings correspond to Modern period land use patterns. However, the area north of the modern town of Korissos, spanning along the centreline from about KP 497 to KP 506, is still considered an area of high archaeological potential. Undiscovered archaeological resources are expected to intersect the centreline and working strip. Engagement with local land owners and intrusive testing will be able to confirm the content and density of subsurface archaeological resources. Cultural heritage sites in the Askion Mountain section are mapped in *Annex 4.7*.

Korissos was initially targeted for survey based upon strong baseline evidence that the valley likely held unknown archaeological sites. This assessment is backed by numerous known archaeological sites in the region. Some of these sites were discovered in a literature survey, others come from the Greek Cultural Ministry LPD database. During the survey of Korissos a number of dense ceramic scatters were recorded. These newly discovered sites were later realized to overlap a number of the Korissos Crop Marks identified by the remote sensing analysis.

[203] Based on field findings and anomalies identified during a rapid review of satellite imagery, the cultural heritage team conducted a crop markings analysis. This analysis identified a possible a network of roads and structures which may be the remains of a buried ancient city near the modern town of Korissos.

Table 6-139 Inventory of Cultural Heritage Sites and Areas of High Archaeological Potential in the Askion Mountain Section Study Area

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Askion Mountain									
486.5	CH-24	-	Ground-truthed Oct. 2011	4	A	Medium density ceramic scatter of Pre-Modern style located on a flat terraced area 4 m north of centerline measuring 0.06 ha in size. No diagnostic sherds were discovered, making dating difficult;	Uncertain, but Pre-Modern	N	L
486.6	CH-125	Variko 4	Ground-truthed Nov. 2010 and Feb. 2011	188	ICH	Unknown chapel (on the road);	Uncertain	N	H
489.2	CH-234	Variko 2	Greek Ministry of Culture LPD	645	A	A site in Kampos, with Neolithic and Bronze Age pottery;	Neolithic, Bronze Age	Unknown	H
489.7	CH-129	Variko 3	Ground-truthed Nov. 2010 and Feb. 2011	407	M, ICH	Church of Aghios Athanassios and recreational area located in a mountainous area;	Uncertain	Y	H
490.3	CH-25	-	Ground-truthed Oct. 2011	106	A	Two small stone paved surfaces approximately 8m apart, measuring approximately 2.5 x 0.60 m each and they may extend more. Site located in a terraced field close to a water stream in a poor visibility area. Possibly part of a foot path (a faint foot path is discernible) or a feature related to traditional agricultural practices (e.g. a threshing floor);	Uncertain	N	M
490.4	CH-26	-	Ground-truthed Oct. 2011	251	A	Small concentration of rocks measuring approximately 3x1 m. Not clear if the rocks are part of natural formations or the upper part of a buried structure. Located on a terrace with poor visibility due to tall grass;	Uncertain	N	M

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
491.1	CH-27	-	Ground-truthed Oct. 2011	228	A	Small concentration of rocks. Not clear if the rocks are part of natural formations or the upper part of a buried structure. Located on a slopping field with poor visibility;	Uncertain	N	L
491.7	CH-130	Klissoura 3	Ground-truthed Nov. 2010 and Feb. 2011	997	M	Monastery of the Virgin Mary (Panagia) in Klissoura. There is an unidentified church opposite the monastery;	1813	Y	H
492.5	CH-215	Klissoura 15	Greek Ministry of Culture LPD	584	M	Church of Aghios Anthonios;	1860	Unknown	H
492.7	CH-213	Klissoura 13	Greek Ministry of Culture LPD	610	M	Trinity Chapel;	Uncertain	Y	H
493.1	CH-135	Klissoura 8	Ground-truthed Nov. 2010 and Feb 2011	950	ICH	Church of Aghia Anastasia-Aghios Nektarios;	Possibly Modern	N	H
493.1	CH-212	Klissoura 6	Greek Ministry of Culture LPD	556	M	Prophet Elias Church;	Possibly late Byzantine	Y	H
493.1	CH-214	Klissoura 14	Greek Ministry of Culture LPD	728	M	Church of Aghios Athanasios;	1847	Unknown	H
493.1	CH-211	Klissoura 7	Greek Ministry of Culture LPD	484	M	Church of Aghios Markos;	1864	Y	H

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
497	CH-28	-	Ground-truthed Oct. 2011	68	A	Dense ceramic scatter intersecting centerline of probable Hellenistic date. Current known extents of the site measure about 1 ha. Site is located in freshly ploughed wheat field and visibility is good. Hellenistic black-slipped sherds were found. The extents of this site are not well know and may extend further to north beyond the margins of the ploughed field. The site lies within the larger context of the ancient Korissos crop marks;	Hellenistic	Y	M
497.6	CH-29	-	Ground-truthed Oct. 2011	38	A	Isolated sherds consisting of a roof tile fragment and an undecorated strap handle and a medium density ceramic scatter consisting of undecorated sherds. Diameter of the surveyed site estimated to be 79 m. Site located in a ploughed agricultural field. The site lies within the larger context of the ancient Korissos crop marks;	Uncertain, but Pre-Modern	N	L
504.1	CH-30	-	Ground-truthed Oct. 2011	0	A	Medium density ceramic scatter intersecting the centerline. Current known extents of the site measure at about 0.7 ha. Site is located in freshly ploughed wheat field and visibility is good. Pottery may be Roman, but few diagnostic sherds were recovered. The site lies within the larger context of the ancient Korissos crop marks;	Roman	Y	H
504.3	CH-31	-	Ground-truthed Oct. 2011	7	A	Medium density ceramic scatter intersecting the centerline. Current known extents of the site measure at about 0.04 ha. Pottery may be Roman, but few diagnostic sherds were recovered. The site lies within the larger context of the ancient Korissos crop marks;	Roman	Y	H

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
504.4	CH-32	-	Ground-truthed Oct. 2011	2	A	Medium density ceramic scatter in freshly ploughed wheat field intersecting the centerline. Current known extents of the site measure at about 1.15 ha. Pottery may be Roman, but few diagnostic sherds were recovered. The site lies within the larger context of the ancient Korissos crop marks;	Roman	Y	H
504.6	CH-136	Korissos 4	Ground-truthed Oct. 2011	821	A	Hellenistic–Byzantine settlement on “Tsakoni” mound. It is possible that the settlement is located on top of the hill and the cemetery at the foothill. To the east of the hill, a mound, possibly serving as the acropolis of the settlement. On-site finds include Hellenistic-Byzantine coins, marble architectural fragments and inscriptions;	Hellenistic–Byzantine	Y	H
505	CH-33	-	Ground-truthed Oct. 2011	8	A	Low density ceramic scatter in freshly ploughed wheat field intersecting the centerline. Current known extents of the site measure at about 1.1 ha. Pottery may be Roman, but few diagnostic sherds were recovered. The site lies within the larger context of the ancient Korissos crop marks.	Roman	Y	H

Notes		
	Site Types	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument
	Site Importance	
	H	High
	M	Moderate/Medium
	L	Low
	Cultural Heritage Site Number	
	CH	Cultutal Heritage

Source: ERM (2012)

Of the sites inventoried in the Askion Mountain section of the base case study area, 6 cultural heritage sites were identified within 50 m of the Project footprint, and will be subject to impacts from Project activities. These sites are: a ceramic scatter (CH-24) and five ceramic scatters associated with crop markings which suggest the presence of the remains of an ancient settlement near Korissos (CH-29, CH-30, CH-31, CH-32 and CH-33). The ceramic scatter at KP 486.5 (CH-24) lies outside of the working strip and is of low sensitivity. However, four of the ceramic scatters associated with the Korissos settlement intersect the base case route centreline between KP 504 to 508.3 and at KP 505. These finds are of high importance. The locations of crop marks and ceramic scatters are suggestive of subsurface archaeological resources that intersect the centreline and a pipeyard, and will be directly impacted by Project activities.

6.5.3.2.11 Region West of Kastoria to the Border (KP 507 - 543.2)

A total of 18 sites were identified within the 2 km wide corridor in the region west of Kastoria to the border. The types of sites in the region west of Kastoria to the border are particularly varied. These sites differ in their size, importance and quality. The most common type of cultural heritage site in the region west of Kastoria to the border was archaeological sites. Studies have located 14 archaeological sites, 2 monuments, and 1 site with ICH value and 1 monument with ICH value. Of the 18 sites identified, 2 are of low importance and/or quality, 2 are of moderate importance and/or quality, and 14 are of high importance and/or quality. Site types along this section include:

- Ceramic and scatters (Hellenistic, Roman);
- Officially recognized archaeological sites (Late Neolithic, Roman);
- Places of worship: chapel, shrine, churches (Modern and possibly Historic);
- A Hellenistic or Roman bridge;
- Roman tombs;
- An Iron Age cemetery;
- An Early Christian Basilica;
- A graveyard;
- WWII era military bunkers;
- Contemporary recreational areas;
- A cultural mound and burial ground.

The most notable sites from this region include: the Iron Age cemetery at Krepeni (CH-279), the Late Neolithic archaeological site of Dispilio (CH-207), the cultural mound and possible ancient burial ground (CH-39) and the WWII bunkers with associated shrine, church and recreational areas (CH-41).

In addition, 14 areas of high archaeological potential were identified in association with cultural heritage sites within the region west of Kastoria to the border along the base case route.

An inventory of the cultural heritage sites identified in the region west of Kastoria to the border is presented below in *Table 6-140*. The density of reported archaeological sites and areas of high archaeological potential suggests that this section is of moderate to high archaeological potential. Based on the existing data, this section is a veryarchaeologically sensitive area.

A relatively higher number of additional undiscovered sites and archaeological resources are likely to be present. Cultural heritage sites identified in the region west of Kastoria to the border are mapped in *Annex 4.7*.

Table 6-140 Inventory of Cultural Heritage Sites and Areas of High Archaeological Potential in the Region West of Kastoria to the Border Study Area

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
Region West of Kastoria to the Border									
508.0	CH-137	Krepeni 4	Ground-truthed in Nov. 2010 and Feb. 2011	803	M	Church of Aghios Nikolaos;	Unknown, possibly Post-Byzantine	Y	H
508.0	CH-279	Krepeni 1	Literature review	770	A	Iron Age cemetery. Bronze statuette found here. Designated site;	Iron Age	Unknown	H
512.1	CH-34	-	Ground-truthed in Oct. 2011	62	A	Medium density ceramic scatter of possible Roman date, located on flat agricultural fields next to base of a mountain. The site directly intersects the centerline and thus far has been mapped to about 0.7 ha;	Roman	N	M
512.6	CH-161	Militsa 1	Ground-truthed in Nov. 2010 and Feb 2011	237	A	Surface pottery scatters indicate a Roman settlement in the “Isvor” area. The acropolis of the settlement may be located on the rocky hill to the SE of Isvor;	Roman	Y	H
512.7	CH-162	Militsa 2	Ground-truthed in Nov. 2010 and Feb 2011	803	ICH	Unidentified chapel at the edge of the village and graveyard, close to Militsa 1;	Uncertain	Y	H
512.7	CH-35	-	Ground-truthed in Oct. 2011	27	A	Dense ceramic scatter of possible Roman date located on flat agricultural fields near a permanent water source. The site is located 27 m away from the centerline and is mapped at 0.25 ha, but may extend beyond the freshly ploughed wheat field (which has good visibility) into surrounding areas with poor visibility;	Roman	Y	M

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
512.8	CH-36	-	Ground-truthed in Oct. 2011	21	A	Low density ceramic scatter. This site may be related to the nearby site identified to the East but no diagnostic sherds were uncovered. Visibility was poor as the site was in a mature corn field, so its extents and density may actually be greater than what was found in the field;	Uncertain, but Pre-Modern	N	L
517.3	CH-207	Dispilio 1	Greek Ministry of Culture LPD	632	A	In Nisi area, beside the lake of Kastoria, the designated archaeo-logical site of Dispilio, a unique Late Neolithic settlement dating to the sixth millennium BC. There is an ancient wall dating from 412-399 B.C. There is an on-going systematic excavation and restoration programme. The area north of the road is a protected zone;	Neolithic	Y	H
519.1	CH-37	-	Ground-truthed in Oct. 2011	60	M	A Hellenistic or Roman stone bridge. The dimensions of the bridge are 1 m tall, 2 m wide, and 3 m long. Parts of the bridge are damaged and a small portion of the roof has collapsed in, however, it is generally in good condition. The bridge is known but not recorded in any archaeological database. This was inferred by the presence of a modern tunnel made of cement which butts up against the northern side of the ancient bridge and a portion of the ancient bridge has been mended with cement (although very poorly);	Hellenistic or Roman	Y	H

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
520	CH-225	Argos Orestikon	Greek Ministry of Culture LPD	912	A	Remains of vaulted tombs of the Roman period (2nd-3rd century) and an Early Christian basilica (4th-5th century), on top of Paravella Hill, NW of Argos;	Roman, Early Christian	Unknown	H
520.4	CH-38	-	Ground-truthed in Oct. 2011	13	A	A medium density ceramic scatter of Hellenistic and Roman sherds in freshly ploughed wheat field. Current known extents of the site measure about 0.9 ha. The presence of surface ceramics suggests that there are subsurface archaeological resources present;	Hellenistic, Roman	Y	L
520.4	CH-179	Argos Orestikon 9	Ground-truthed in Nov. 2010 and Feb. 2011	618	A	Argos Orestiko. Archaeological site (*Αρχαιολογικό Έργο στη Μακεδονία και Θράκη – Archaeological Works in Macedonia and Thrace* 2006). Unknown structure at a distance in the fields;	Uncertain	Y	H
521.8	CH-180	Argos Orestikon 8	Ground-truthed in Nov. 2010 and Feb. 2011	448	A	Archaeological excavation site *Αρχαιολογικό Έργο στη Μακεδονία και Θράκη – Archaeological Works in Macedonia and Thrace* 2008). A trench surrounding the hill was visible which may belong to the excavation site;	Roman	Y	H
521.9	CH-181	Argos Orestikon 10	Ground-truthed in Nov. 2010 and Feb. 2011	617	A	Possibly the site of Argos Orestiko 10, located here on a mound in hilly terrain (*Αρχαιολογικό Έργο στη Μακεδονία και Θράκη – Archaeological Works in Macedonia and Thrace* 2006);	Uncertain	Y	H

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
531.3	CH-39	-	Ground-truthed in Oct. 2011	293	A	A cultural mound with a high density ceramic scatter and associated possible burial ground. Current known extents of the cultural mound measure about 1.3 ha. Current known extents of the possible ancient burial ground measure about 0.3 ha;	Roman and earlier	Y	H
532.0	CH-40	-	Ground-truthed in Oct. 2011	259	A	Medium density ceramic scatter on top of a low hill in an agricultural field with the place name "Tomb". Current known extents of the site measure about 0.7 ha. This site is likely not a tomb, given that tombs typically do not have associated ceramic scatters, but it may be a local name that refers to the antiquity of the place;	Possibly Roman	Y	H
535.3	CH-278	Inoi 1	Literature Review	914	A	Remains of a Roman settlement on the naturally fortified Ayios Nikolaos Hill, to the East of the village;	Roman	Y	H
539.3	CH-41	-	Ground-truthed in Oct. 2011	827	M, ICH	WWII mountaintop bunkers and trenches facing the Albanian border along with a shrine, a church and two recreational areas. The WWII installments seem to be important to the people living in the local area.	Historic	Y	H

Notes	**Site Types**	
	A	Arcaheological Site
	AHAP	Area of High Archaeological Potential
	ICH	Site with Intagible Cultural Heritage
	M	Monument

km point (KP)	*Cultural Heritage Site Number*	*Site Name*	*Source of Site Information*	*Distance to Centreline or Project Component (m)*	*Site Type*	*Description of Site*	*Period*	*Associated Area of High Archaeological Potential? (Y/N)*	*Site Importance and/or Quality*
	Site Importance								
	H	High							
	M	Moderate/Medium							
	L	Low							
	Cultural Heritage Site Number								
	CH	Cultutal Heritage							

AEMT: Αρχαιολογικό Έργο στη Μακεδονία και Θράκη 2006 (Archaeological Works in Macedonia and Thrace)

Source: ERM (2012)

Of the sites inventoried in the base case study area in the region west of Kastoria to the border, 3 cultural heritage sites were identified within 50 m of the Project footprint, and will be subject to impacts from Project activities. These sites are: ceramic scatters (CH-35, CH-36 and CH-38). The ceramic scatter at KP 512.8 (CH-36) is of low sensitivity but will be impacted by Project activities, since it is located within the working strip. The ceramic scatters at KP 512.1, KP 512.7 and KP 520.4 (CH-34, CH-35 and CH-38) will be directly impacted by Project activities, as they intersect the base case route centreline. CH-34 and CH-35 are considered of moderate importance. The most sensitive sites are cultural mound and ceramic scatter (CH-39 and CH-40), located between KP 531.3 and 532. These sites are of high importance and pose a constraint to the Project, as they will be directly impacted by Project activities.

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